IN THE UNITED STATES DISTRICT COURT FOR THE
NORTHERN DISTRICT OF OKLAHOMA

W. A. DREW EDMONDSON, in his capacity as ATTORNEY GENERAL OF THE STATE OF OKLAHOMA and OKLAHOMA SECRETARY OF THE ENVIRONMENT C. MILES TOLBERT, in his capacity as the TRUSTEE FOR NATURAL RESOURCES FOR THE STATE OF OKLAHOMA,	)
Plaintiff,	)
vs.	) 4:05-CV-00329-TCK-SAJ
TYSON FOODS, INC., et al,	)
Defendants.	)

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DEPOSITION OF ROGER OLSEN, PhD, produced as a witness on behalf of the Defendants in the above styled and numbered cause, taken on the 10th day of September, 2008, in the City of Tulsa, County of Tulsa, State of Oklahoma, before me, Lisa A. Steinmeyer, a Certified Shorthand Reporter, duly certified under and by virtue of the laws of the State of Oklahoma.

Exhibit R

A P P E A R A N C E S

FOR THE PLAINTIFFS:	Mr. David Page Mr. Richard Garren Attorneys at Law 502 West 6th Street Tulsa, OK 74119
FOR TYSON FOODS:	Mr. Robert George Attorney at Law 2210 West Oaklawn Drive Springdale, AR 72762 -and- Mr. Bryan Burns Attorney at Law 2210 West Oaklawn Drive Springdale, AR 72762 (Via phone)
FOR CARGILL:	Ms. Theresa Hill Ms. Leslie Southerland Attorneys at Law 100 West 5th Street Suite 400 Tulsa, OK 74103
FOR SIMMONS FOODS:	Ms. Vicki Bronson Attorney at Law 211 East Dickson Street Fayetteville, AR 72701 (Via phone)
FOR PETERSON FARMS:	Mr. Scott McDaniel Attorney at Law 320 South Boston Suite 700 Tulsa, OK 74103
FOR GEORGE'S:	Mr. James Graves Attorney at Law 221 North College Fayetteville, AR 72701

FOR CAL-MAINE:	Mr. Robert Sanders Attorney at Law 2000 AmSouth Plaza P. O. Box 23059 Jackson, MS 39225 (Via phone)
FOR WILLOW BROOK:	Ms. Jennifer Griffin Attorney at Law 314 East High Street Jefferson City, MO 65109 (Via phone)

I N D E X

(Whereupon, the deposition began at 9:03 a.m.)

VIDEOGRAPHER: We are now on the Record for the deposition of Dr. Roger Olsen. Today is September 10th, 2008. The time is 9:03 a.m. Would counsel please identify themselves for the Record? 09:03AM

MR. PAGE: David Page for the State of Oklahoma.

MR. GEORGE: Robert George for the Tyson defendants. 09:03AM

MR. McDANIEL: Scott McDaniel for Peterson Farms, Inc.

MR. GRAVES: James Graves for George's, Inc., and George's Farms, Inc.

MS. HILL: Theresa Hill for Cargill, Inc., and Cargill Turkey Production, LLC. 09:03AM

VIDEOGRAPHER: And on the phone?

MS. GRIFFIN: Jennifer Griffin for Willow Brook Foods.

MR. SANDERS: Bob Sanders for the Cal-Maine defendants. 09:03AM

MR. BURNS: Bryan Burns for the Tyson defendants.

MS. BRONSON: Vicki Bronson for Simmons Foods. 09:03AM

VIDEOGRAPHER: Thank you. The witness may be sworn in.

ROGER OLSEN, PhD

having first been duly sworn to testify the truth, the whole truth and nothing but the truth, testified as follows:

DIRECT EXAMINATION

BY MR. GEORGE:

Q Dr. Olsen, it's good to see you again. Are you still employed with Camp, Dresser & McKee? 09:03AM

A Yes.

Q During your deposition in January of this year you testified that the South Carolina law firm of Motley Rice was paying for CDM's work in this case. Is that still true? 09:04AM

A That's correct.

Q Has Attorney General Drew Edmondson or the Oklahoma Secretary of the Environment paid CDM for any work that it's performed in this case?

A No. 09:04AM

Q Has the State of Oklahoma paid CDM for any work that it's performed in this case?

A No.

Q How much has CDM been paid to date, if you could estimate for me, for its work in this case, 09:04AM

including expenses?
A I have not updated that since my -- or looked at that since my last testimony.
Q I believe if I recall correctly, and you correct me if I'm wrong on this, that in January you indicated that CDM had been paid, you believed, in excess of 8 million dollars; does that sound about right? 09:04AM
A That's about right, yeah.
Q I assume that your firm has continued to work on the case since January; is that true? 09:04AM
A That's true.
Q You've written a report that is in front of you on the table today; is that correct?
A Yes, I have. 09:05AM
Q Okay. You just don't have an estimate as to today what the total billing would have been from your firm to the South Carolina law firm of Motley Rice?
A No. 09:05AM
Q Dr. Olsen, you gathered considered materials, file materials and produced them to Mr. Page in connection with your work in this case; is that correct?
A To Mr. Page and Motley Rice attorneys. 09:05AM

Q Okay. You delivered them to Motley Rice?
A Yes, yes, I did.
Q Did you include billing statements in those materials?
A The ones that I had. 09:05AM
Q Okay. Well, your firm would presumably have copies of all of the bills that it sent to Motley Rice for this case; do you agree?
A Yes, they do. I don't typically keep those in my files. 09:05AM
Q Okay. Did you make a special attempt to contact your accounting department to gather those bills or did you produce whatever bills you happened to have in your files?
A Yeah, and typically I delete those. When they come in, I review them and I don't retain those. 09:05AM
MR. GEORGE: David, I want to make a request on the Record for a complete set of invoices for Camp, Dresser, McGee's (sic) work.
MR. PAGE: Is this a Rule 34 request? 09:06AM
MR. GEORGE: It's a request on the Record for this deposition. You can interpret it however you like.
MR. PAGE: Well, fine. You can request it. I don't understand the basis for your asking for 09:06AM

those documents.

MR. GEORGE: I believe they should have been produced under Rule 26 in connection with his expert disclosures, which have already occurred in this case. 09:06AM

MR. PAGE: As considered materials? Is that your understanding, Mr. George, that these would be considered materials --

MR. GEORGE: Rule --

MR. PAGE: -- bills?

MR. GEORGE: I'm sorry. I didn't mean to cut you off, David. Rule 26 is broader than considered materials. There's a category of information beyond just scientific information reviewed by an expert that should be produced, and 09:06AM part of that relates to an expert's compensation.

MR. PAGE: Yeah, there is -- there is information that's allowed for the compensation. So I'll review your request and we'll provide some response. 09:06AM

Q Dr. Olsen, I've placed in front of you what I've marked as Exhibit 1 to your deposition. Could you please identify Exhibit 1?

A This looks like a copy of my expert report that I produced on May 14th of this year. 09:07AM

Q Dr. Olsen, does that appear to be a complete copy as near as you can tell from the time you've had with it this morning?
A Yeah, and I only spent like two minutes to make sure there was text, tables and figures. I didn't see those. There was a subsequent errata that was produced with this, too, that's not here. 09:08AM
Q Dr. Olsen, does the report that's been marked as Exhibit No. 1 and the errata that you just referred to set forth all expert opinions that you've formed in connection with your work in this case and identified the basis for those opinions? 09:08AM
A Yes, it does.
Q Who drafted your expert report that's been marked as Exhibit No. 1? 09:08AM
A I had various people working under my supervision draft specific sections of this. Some of them I actually wrote the first time and then I reviewed it all, consulted with them with any areas and then I typically made all the final changes and last edits. Sometimes I directed them to do that, and they produced those final changes and edits. 09:08AM
Q Dr. Olsen, could you look at the table of contents and if you could, identify for me as best you can recall the sections of the report that you 09:09AM

wrote the first draft for yourself as opposed to sections that were in the first instance written by someone else.

A Okay. I'll do that. Introduction, I wrote all that. Section 2, I created -- these are all set up identically. I usually created the introduction, sampling objective, intended use and then let other people draft the rest of them. 09:09AM

Q Okay, and that would be true to Section 2.1 through two point -- 09:10AM

A I wrote Section 2.10, all of that.

Q Okay. Let's see if we can clean this up a little bit. Generally with respect to Sections 2.1 through 2.5, you wrote the subsection entitled Sampling Objectives and Intended Data Use; is that right? 09:10AM

A No. Section 2.1 through 2.15, all of Section 2, and then I'm going to go into that, into ones I did, you know, the first draft of the whole sections. 09:10AM

Q Okay, okay. Go ahead and do that.

A Is that clear?

Q Not particularly, but maybe we'll get it straightened out. You told me with respect to Section 2.1, that you wrote Section 2.1.2, which is 09:11AM

entitled Sampling Objectives and Intended Data Use; correct?

A Yes, and I wasn't referring just to that section. I was referring to all these sections in Section 2. I'm sorry if that wasn't clear. 09:11AM

Q So, for example, you would have authored the first draft of Section 2.2.2, which is also entitled Sampling Objectives?

A Yeah.

Q Is that right? 09:11AM

A Yes.

Q And that same pattern would repeat all the way through --

A Right.

Q -- Section 2? 09:11AM

A Right.

Q Now, I think you mentioned that there was one of these that you wrote the entire subsection; is that right?

A Yeah, and I'm going through the whole table of 09:11AM contents to see which ones I wrote --

Q Okay. Please do.

A -- entire sections on. 2.10, I wrote that entire section.

Q For the Record, Section 2.10 is USGS -- 09:12AM

A Yes.
Q -- samples?
A So that's the one that I wrote everything on.
Q Okay. Let's stay within Section 2, Sample Collection if we can. 09:12AM
A Sure.
Q With respect to all of the subsections that you did not write in the first instance, who did write them in the first instance?
A Darren Brown wrote Poultry Waste and Soil, and 09:12AM a lot of this is taken from the SOPs and, for instance, 2.1.4, Sampling Approach and Scheme, Field and Laboratory Analysis, a lot of that is right out of the SOP, which I was the primary author on for that section, so he was actually taking things -- I 09:13AM wrote it but as far as specific to your question, he did the first draft of what you see here.
Q Let's stay with my question if we can. Darren Brown wrote the balance of Sections 2.1 and 2.2; right? 09:13AM
MR. PAGE: Object to the form.
A That's right.
Q Who wrote Section 2.3 with the exception of the one subpart that you identified?
A 2.3 was written by Brian Bennett. 09:13AM

Q And who is Brian Bennett?
A He's a CDM employee.
Q And what is his professional training?
A He's a biologist by training.
Q What office? 09:13AM
A He's out of the St. Louis office.
Q Okay. 2.4, Small Tributary Sampling, with the exception of the sampling objectives portion, who wrote Section 2.4?
A That was written by Tim Cox. 09:13AM
Q And who is Tim Cox?
A Tim Cox is a CDM employee.
Q In what office?
A He's out of our New Zealand office. Used to be in Denver. 09:14AM
Q And what professional training or area of expertise does Tim Cox specialize in?
A He is a surface water expert, hydraulics, mostly.
Q Do you know his professional degree? 09:14AM
A No. I was going to look that up. I keep forgetting. He has both an undergraduate and a PhD.
Q All right. Let's keep going. Section 2.5 on groundwater samples, with the exception of the sampling objectives portion that you wrote, who 09:14AM

wrote the first draft of Section 2.5?
A Darren Brown wrote 2.5.
Q Section 2.6 of your report, Spring Sampling, with the exception of the sampling objectives portion, who wrote the first draft of Section 2.6? 09:15AM
A Brian Bennett.
Q Section 2.7 entitled Sediments in Rivers and Small Lakes, with the exception of the sampling objectives portion that you wrote, who authored the first draft of this section? 09:15AM
A Brian Bennett in conjunction with Drew Santini.
Q All right. Who is Drew Santini?
A Drew Santini is a CDM employee.
Q In what office, sir? 09:15AM
A He's out of our Lansing, Michigan office.
Q And what is his area of expertise or specialized area of professional training?
A He's -- actually has an engineering degree but, again, he's like Brian Bennett, well 09:15AM experienced in sampling of rivers and streams.
Q Dr. Olsen, Section 2.8 entitled Surface Water Sampling, with the exception of the sampling objective portions of that part of your report, who authored the first draft of that section? 09:16AM

A Both Brian Bennett and Ron French.
Q Who is Ron French?
A Ron French is a CDM employee.
Q In what office?
A St. Louis. 09:16AM
Q And what is Ron French's area of expertise?
A He's a biologist by training, but he has -- he's a senior -- he has lots of -- senior employee at CDM. He has lots of surface water and aquatic biology sampling. 09:16AM
Q Dr. Olsen, Section 2.8 -- I'm sorry, Section 2.9, entitled Samples Collected for qPCR, with the exception of the sampling objective portion, who authored the first draft of Section 2.9?
A Brian did that, too, but I had lots of input to that. I wrote subsections of that, like number of samples, types of data, that type of thing. 09:17AM
Q So a collaborative effort of you and Mr. Bennett?
A Right. 09:17AM
Q Okay, and I think you told me you authored the first draft of the entirety of Section 2.10; correct?
A That's right.
Q Section 2.11 entitled Lake Tenkiller, with the 09:17AM

exception of the sampling objectives portion, who authored the first draft of Section 2.11?

A Brian Bennett in conjunction with Drew Santini.

Q Section 2.12 entitled Lake Tenkiller Sediments, with the exception of the sampling objectives portion of that part of your report, who authored the first draft of Section 2.12? 09:17AM

A I think Brian did that in conjunction with Bert Fisher. Bert Fisher had input on the springs, too, I think now that I remember. 09:18AM

Q Let's go back. Where were the springs that you're recalling; what section?

A I can't remember for sure whether he had on the springs. 09:18AM

Q Would this be Section 2.6?

A Yeah, yeah.

Q Is Mr. Fisher a CDM employee?

A No.

Q Another expert retained by Motley Rice in this case? 09:18AM

A Yes.

Q Section 2.13, Reference Locations, with the exception of the sampling objectives portions of that part of your report, who authored the first 09:18AM

draft of Section 2.13?
A This was a collaborative effort, depending on what part it was, between Brian and Darren.
Q Brian Bennett and Darren Brown?
A Yes, sir. 09:19AM
Q Section 2.14, Manure, with the exception of the sampling objectives portion, who authored the first draft of Section 2.14?
A That was Darren Brown.
Q Section 2.15, Poultry Houses in the Illinois 09:19AM River Watershed, who drafted the first draft of that section?
A That was Brian in conjunction with myself and Larry Hight.
Q Who is Larry Hight? 09:19AM
A Larry is an employee of Bert Fisher's.
Q Okay. Let's talk broadly about Section 3 entitled Laboratory Analysis.
A Yes.
Q Is there a consistent pattern of your 09:20AM authorship in this section as there was in the last?
A No. We would have to go over each section here.
Q Well, tell me -- if you could, identify the sections or subsections that you believe you 09:20AM

authored the first draft of.
A Section 3.1, 3.2 and 3.4, either I did first ones on that or Todd Burgesser did first, but I ended up by the final writing most of those two sections, 3.1, 3.2, 3.4 I think. 09:21AM
Q Let's talk about Todd Burgesser. Who is Todd Burgesser?
A Todd Burgesser is a CDM employee.
Q In what office?
A He's in the Denver office. 09:21AM
Q And what is his area of professional expertise?
A He's an analytical chemist.
Q All right. Can you identify for me who authored the balance of what we see in Section 3 of 09:21AM your report?
A Todd Burgesser, and then I wrote Section 3.12.
Q Entitled Cross Contamination Evaluation?
A Yes.
Q That's your work? All right. Section 4 of 09:21AM your report is entitled Database Compilation. Did you author the first draft of that section?
A No.
Q Who did?
A Drew Santini. 09:22AM

Q Section 5 is entitled Laboratory Results. Did you author the first draft of that section?
A Actually Drew Santini did the compilation of that section but I wrote the actual text.
Q When you say Drew Santini did the compilation, what do you mean? 09:22AM
A Well, this is -- mostly refers to an appendix. So he did the appendix, but the actual text which is -- just lists what is in the appendix, I wrote the text. 09:22AM
Q Okay. Section 6 entitled Evaluation of Sources of Contamination in the Illinois River Watershed, did you author the first draft of that section?
A Again, this is the collaborative effort, depending on what sections. 09:22AM
Q Which sections did you author directly?
A 6.1 and 6.2.
Q Purpose and Evaluation Approach?
A Yes. Bert Fisher did 6.3 of that. First drafts, but with considerable input from me, 6.4 was done by Jessica Jeppson, J-E-P-P-S-O-N. 09:23AM
Q Is that all of Section 6.4?
A 6.4.3.5, I did that whole section.
Q The hazardous substance in poultry waste, 09:23AM

that's your work?
A Yes, but, again, all of this I had substantial interaction.
Q Well, let's stay with 6.4 for a moment. Who is Jessica Jeppson? 09:24AM
A She's a CDM employee.
Q In what office?
A Denver office.
Q And what is her area of professional training or expertise? 09:24AM
A She's a chemist.
Q 6.5, Pathway Sampling Approach, who authored the first draft of Section 6.5?
A I wrote that.
Q Section 6.6, Indicator Chemicals in Water, who 09:24AM authored the first draft?
A I think that was Jessica Jeppson also. Yeah, she did.
Q Section 6.7, Indicator Chemicals in Sediments, who authored the first draft of Section 6.76 of your 09:24AM report?
A Jessica Jeppson did that, too.
Q Section 6.8 entitled Characterization of Poultry Waste Related to Contaminant Transport, who authored the first draft of Section 6.8 of your 09:24AM

report?
A This was a collaborative effort between Jessica Jeppson, Bert Fisher and Tim Moody, M-O-O-D-Y.
Q Who is Tim Moody? 09:25AM
A He's a CDM employee.
Q In what office?
A In the Denver office.
Q And what is his area of professional training or expertise? 09:25AM
A His degree is in -- PhD in soil science but he's an environmental chemist.
Q Section 6.9 entitled Phosphorus Concentration Versus Poultry House Density, who authored the first section of -- I'm sorry, the first draft of Section 09:25AM 6.9 of your report?
A That was Tim Cox.
Q Section 6.10, qPCR Biomarker, who authored the first section of 6.10, the first draft, I'm sorry, of Section 6.10 of your report? 09:26AM
A That was actually all taken from materials supplied by Dr. Harwood, and actually Jessica Jeppson took the first crack at that, but I ended up rewriting most of that.
Q But the source material for Section 6.10 came 09:26AM

from Dr. Harwood?
A Yes.
Q Okay, and Dr. Harwood is not a CDM employee; correct?
A That's right. 09:26AM
Q She's another expert retained by Motley Rice?
A That's correct.
Q Okay. Section 6.11, Chemical and Bacterial Signatures Using PCA Techniques, who authored Section 6.11, first draft? 09:26AM
A Rick Chappell and myself, we divided specific sections on that. He wrote some and I wrote some.
Q Okay, and who is Rick Chappell?
A He's a consultant at CDM.
Q He's not a W-2 employee? 09:27AM
A No, no longer. He was for many years.
Q Who does he work for now?
A He has his own company.
Q What's the name of that company?
A Environmental something something. Sorry. I don't know the exact name of that. 09:27AM
Q Where is Mr. Cox physically located, if you know?
A Chappell.
Q I'm sorry, Mr. Chappell. 09:27AM

A He's in Denver.
Q How long ago did Mr. Chappell leave the employ of CDM?
A Oh, that's a good question. Probably three to four years ago. 09:27AM
Q And in terms of compensation, I assume Mr. Chappell has been compensated for his work; correct?
A Yes.
Q Okay. Who was responsible for his compensation? 09:28AM
A Motley Rice. He was a subcontractor, which -- so his invoice would appear as a subcontractor on our invoices.
Q He would bill CDM and CDM would bill Motley Rice? 09:28AM
A Yes. So when I said Motley Rice, it's -- he doesn't bill Motley Rice or work for them directly. He works for us. He's on our payroll or our invoices -- not on the payroll but our invoices.
Q What particular parts, if you can tell me, did Mr. Chappell draft in Section 6.11? 09:28AM
A We'd have to go through that individually. If you want to do that, we can do that now.
Q Can we do it quickly?
A Well, there's -- 09:28AM

Q Let's go there. We'll see how long it takes. I believe it begins on Page 632, Dr. Olsen.
A Yes, sir.
Q Okay. Run me through there and tell me which portions you wrote versus which portions -- 09:29AM
A I wrote the introduction.
Q Okay. 6.11-1?
A I wrote 6.11 dash -- 6.11.2, Steps.
Q Steps of PCA?
A Right. Well, the first part of it, and then 09:29AM he -- I actually wrote the first step but I was pulling from various pieces he gave me. Like Step 6, he wrote essentially all of that and I pulled it in and put it in the first shot at this whole section. So that's describing the databases and 09:30AM everything he wrote.
Q Let me ask this question while we're on it, Dr. Olsen.
A Sure.
Q The source material for the steps of the PCA 09:30AM process came from Dr. -- or from Mr. Chappell; is that right?
A No.
Q Did I not?
A No.

Q I thought that's what you said.
A No.
Q Keep going.
A I wrote Step 8, and I'm going through this pretty quick. He wrote Step 9. I pulled through parts of Step 10. We both wrote parts of Step 11. I wrote Step 12. I wrote Step 13. We wrote Step 14 together, and I wrote Step 15. 09:30AM
Q Go back to Page 6-61 for a moment. There's a section that kind of appeared in the middle of the steps and I want to ask you about it. 09:32AM
A Sure.
Q Entitled Evaluation of Potential Impact of Cattle Manure.
A Yes. 09:32AM
Q Who authored the first draft of that section?
A I did.
Q Okay.
A And just to finish this off, 6.12 I was the primary author on. 09:32AM
Q Thank you. Dr. Olsen, since preparing this report, has CDM undertaken any work in connection with this case other than producing your errata, producing your considered materials and preparing for this deposition? 09:33AM

A Yes.
Q What has CDM worked on?
A There was a spring biological sampling that was done. That included weekly observations of algal cover throughout the basin. 09:33AM
Q When you say spring, approximately when was it done; was it done after this report was submitted in May of 2008?
A Probably about that same time. I'd have to check the exact dates on that, but usually we try to 09:33AM get out there -- the same that was done in here before, and I think that was like late April into May, if I remember right, but I can find out for sure on that if we need to.
Q Dr. Olsen, has the data from that spring 09:34AM biological sampling program been delivered to CDM from the lab?
A That was all field data. I don't think there was any lab data associated with that.
Q So give me an idea what type of field data 09:34AM would be collected in connection with that sample.
A I think they just did algal cover observations.
Q So what would that look like; is it a count?
A It's a field sheet that they fill out with a 09:34AM

viewing bucket.
Q Someone scoops up some water and --
A No, no.
Q I'm sorry. Go ahead.
A I think they actually put the viewing bucket into the water, and it has holes in the bottom, and they count. 09:34AM
Q Count what?
A Count the algal cover on the bottom of sediments and things like this. 09:35AM
Q Okay, and who was involved in that field effort in the spring of this year?
A Like all our field efforts, Darren Brown sets those up. I forget the exact personnel he pulled from that, who that was. You know, it probably could have been Brian Bennett or some of the other crew. It would have been people that Jan Stevenson trained to do this. 09:35AM
Q Is that work intended for Jan Stevenson's use in this case? 09:35AM
A That's right.
Q And has he received the field sheets; do you know?
A That's a good question. I think he has.
Q What was the purpose of the spring 2008 09:35AM

biological sampling?
A That was essentially to supplement the data that had already been collected for algal cover in another year and another set of circumstances.
Q Was the data that was available to Dr. Stevenson inadequate in some way? 09:36AM
A No. Again, I think the overall feeling that this year was a little bit different from the previous years because of the heavy rains, and so that would be, you know, maybe a slightly different circumstance and maybe not. 09:36AM
Q Do you know if Dr. Stevenson is working on a supplemental report based upon the results of the spring biological sampling?
A I don't know for sure the status of that right now. 09:36AM
Q Well, have you heard that he's working on a supplemental report?
A No.
Q What else has CDM worked on since you submitted your report? 09:36AM
A We've also done lake sampling events.
Q And when did the lake sampling events occur?
A We've done three months. We did June, July and August, and we're going to do a September event, 09:37AM

too. I think that's scheduled for next week.
Q Has Mr. Page told you that the deadline for expert reports has passed?
A Yes.
Q Okay. You're still sampling? 09:37AM
A Yes.
Q Okay. What are you sampling for in Lake Tenkiller over the last three months and then next month again?
A They did profiles and, again, I mean by 09:37AM profiles, those are every meter sampling with the field meters for DO conductivity, temperature at the four locations in the lake that we've done before. So this is essentially --
Q The same four stations? 09:38AM
A Same four stations, same profiles, and then we're doing a phosphorus, three forms of phosphorus at select samples and select depths, and we're doing chlorophyll. Seems like there was -- I think that's all we're doing. 09:38AM
Q Who will be the recipient of that data after it's generated among Motley Rice's scientific team?
A Denny Cooke and Gene Welch, and that data is produced to you all as soon as it's available from the lab. 09:38AM

Q Has it been produced yet?
A Yes.
Q It's been produced to the defendants?
A Yes.
Q How do you know that? 09:38AM
A Because we automatically -- well, that's a good question. We automatically send that right away, and I assume that they are producing it right away but --
Q Who do you send it to? 09:39AM
A We send that to Mr. Bullock.
Q Mr. Bullock?
A Yeah, Louis.
Q And you've already sent him some data from the lake sampling? 09:39AM
A Yes.
Q Okay. Are Mr. Cooke and Mr. Welch working on a supplemental report to reflect the results of the summer sampling of Lake Tenkiller?
A I don't know if they're working on supplement report. They've reviewed the data as it comes in and actually, as I understand, Dr. Welch discussed it in his deposition. That has occurred already. 09:39AM
Q What else has CDM done since you submitted your expert report in May of 2008? 09:39AM

A Personally, you know, I've reviewed other expert reports and communicated with them, and as questions continue to come up, you know, I continue to respond -- respond to them.

Q Did you review any drafts of expert reports from non-CDM testifying experts prior to those reports being finalized? 09:40AM

A I reviewed some of Dr. Fisher's work and some of Dr. Engel's work. I've also reviewed doctor -- some of Dr. Welch's and Dr. Cooke's work, too, before they submitted their final reports. 09:40AM

Q Did you recommend any changes in those reports?

A I can't remember at this time. I was looking more for consistency, for instance, on Dr. Engel's work, wanting to make sure that we were using the same information from Tim Cox. So I don't remember if there was any comments on that. I know that accidentally some of that got left out of my report and I had to supplement with the graphs, but they were the same as he had, so we were all consistent with that. 09:41AM

Q You referenced data from Tim Cox. Are you referring to the poultry house density and phosphorus correlation data? 09:41AM

A That's correct.
Q Okay. Dr. Olsen, have you talked with Mr. Page or any of the other lawyers working on this case about the possibility of completing any additional analysis or formulating any additional opinions beyond those set forth in your expert report? 09:41AM
A We've generally talked about, of course, the supplemental data that I just talked about, and we've not made any discussions about how that would be submitted or if it would be submitted or the exact form of that. 09:42AM
Q Okay, but beyond the work around the additional sampling that you've described, have you had any discussions or made any plans for the formulation of additional opinions by yourself, Dr. Olsen? 09:42AM
A No.
Q Okay, and have you been asked to undertake any additional analysis beyond analysis associated with sampling you just described? 09:42AM
A No, except I have reviewed all the final reports of the experts, the other experts, most of them.
Q So, Dr. Olsen, when we get -- what I'm getting 09:42AM

at here is I have to represent my client obviously, and I want to have a clear understanding of what you are going to testify to --

A Right.

Q -- when we go to trial next year. Would it be reasonable for me to assume that when we get to trial in September, you are going to be offering the opinions that are set forth in your expert report? 09:42AM

A Unless something happens between now and then.

Q If something happens between now and then, is it your plan to notify us that something has happened between now and then? 09:43AM

A Certainly that would be through Mr. Page.

Q Okay, all right. Go to Section 6.8.3 of your report, Page 6-26, entitled Contaminant Movement From Edge of Field to Lake Tenkiller. 09:43AM

A Yes.

Q And you refer in the first sentence to Dr. Bert Fisher, and I think you told me earlier that he drafted the first draft of this section; is that correct? 09:44AM

A That's correct.

Q Okay. Did you review Dr. Fisher's work that is set forth in Section 6.8.3?

A Yes, I did. 09:44AM

Q Did -- and generally is this -- would it be fair to characterize this portion of your report and Dr. Fisher's work as a ratio analysis; do you understand that term?

A Yes. 09:44AM

Q Okay. He's comparing ratios in poultry litter and edge of field samples to ratios of those same substances in sediments; is that right?

A That's right.

Q Okay. Did you note any mistakes in the work 09:44AM that Dr. Fisher outlined in his May 2008 report?

A There's nothing that changes in this write-up, but I understand that he's submitted -- he discovered some mistakes and is intending to send an errata on some of the ratio calculations he did. 09:45AM

Q You're aware included in the ratio analysis that you reference in your report by Dr. Fisher was some comparisons between poultry litter and cattle manure?

A Yes. 09:45AM

Q And is it your understanding or have you been told that Dr. Fisher conceded at his deposition that every ratio that he reported in his report on those subjects was in error?

A It wasn't reported that every error. I knew 09:45AM

there were some errors in what he did.
Q Okay, and you didn't catch those errors in your review of his work?
A No, I did not try to repeat. It wasn't my purpose to repeat calculations that he had done. 09:45AM
Q Did you undertake any analysis to try to validate the ratio analysis put forth by Dr. Fisher and summarized in Section 6.8.3?
A No.
Q Okay. As a general matter, is it fair, Dr. Olsen, to say that Section 6.8.3 in this ratio analysis is the opinion of Dr. Fisher as opposed to your independent opinion? 09:46AM
A I had done similar type calculations, particularly the correlation. 09:46AM
Q But none of that is set forth here, is it?
A But it comported with what I previously had done, so I had no reason to doubt what he had done, and the conclusions were similar to conclusions I've made independently. 09:46AM
Q Dr. Olsen, when we get to trial, do you intend to offer a ratio analysis similar to what Dr. Fisher has described in Section 6.8.3?
A No, but I will depend on that weight of evidence in my opinion, the conclusions that he 09:46AM

makes.
Q I'm not sure what you mean by depend on that weight of evidence. What are you talking about?
A Well, as I outlined in this section, my opinions are based on a weight of evidence and by 09:47AM
weight of evidence, I mean each of these sections. So in that case, I will use the opinions by others in forming my final opinions.
Q Would you use those opinions if those opinions
are flawed? 09:47AM
A No.
Q You wouldn't rely upon an opinion that was in error, would you?
A No.
Q Turn to Section 2.15, which I believe is on 09:47AM
Page 2-62 of your report, entitled Poultry Houses in the Illinois River Watershed.
A Yes.
Q I believe you told me earlier that this
section, at least the first draft, was authored by 09:47AM
Brian Bennett and Larry Hight. Larry, of course, reports to Dr. Fisher; is that correct?
A Right. So Larry had communication with Bert Fisher on this, if I remember right.
Q And, Dr. Olsen, you referenced Dr. Fisher's 09:48AM

work in support of this section of your report; correct?

A Yes. He's the expert.

Q Okay. Is it true that Dr. Fisher as opposed to CDM directed the work around identifying and enumerating poultry houses in the watershed? 09:48AM

A That's right.

Q Okay. Dr. Fisher and his team is the group that assembled the dataset that's discussed in Section 2.15? 09:48AM

A That's correct.

Q Okay, and you've got some density maps in your expert report, poultry house density reports. Are you familiar with those?

A Yes. 09:48AM

Q And do I understand correctly that those density maps are based upon the data assembled by Dr. Fisher?

A That's correct.

Q Okay. Did you do anything to validate Dr. Fisher's estimation of the number of poultry houses and the location or density of those houses in the watershed? 09:49AM

A No.

Q Okay. Turn to Section 6.9.2, which is 09:49AM

actually just 6.9 on Page 6-28 entitled River Phosphorus Concentrations Versus Poultry House Density; do you see that?

A Yes.

Q The opening paragraph says, this section is a summary of investigations conducted under the direction of Dr. Engel; do you see that? 09:49AM

A Yes.

Q And Dr. Engel is not a CDM employee, is he?

A That's right. 09:50AM

Q He is one of the other independent scientists retained by Motley Rice in this case?

A That's correct.

Q Okay. There's a discussion of a regression analysis on phosphorus concentrations and poultry house density; is that a fair description of what 6.9 is? 09:50AM

A Yes.

Q Who conducted that regression analysis?

A Tim Cox. 09:50AM

Q When you say this was conducted under the direction of Dr. Engel, Tim Cox is a CDM employee, so how did that work?

A Tim Cox and I essentially started this work, and then after Dr. Engels (sic) was retained, I put 09:50AM

those two in contact with each other, and they were communicating directly. Many times I was on the phone; many times I wasn't on the phone in those conversations.

Q In terms of primary responsibility from the time Dr. Engel came on board, was he primarily responsible for the quality and reliability of the work in Section 6.9? 09:51AM

A Yes. He was ultimately responsible for that.

Q Okay, and from the time that you sort of handed this off to Dr. Engel going forward, did you do anything, Dr. Olsen, to affirmatively validate the results of the regression analysis described in Section 6.9? 09:51AM

A Yes, I did. 09:51AM

Q What did you do to validate it?

A Again, I was working with Tim on this. Some of my role was initially -- well, did you ask since he took --

Q Yes. 09:51AM

A I think I had validated some of those curves through Rick Chappell before it was turned over to Bernie, so we were doing similar -- Bernie continued to do similar approaches and got similar graphs. The only thing that I think I worked on that was 09:52AM

substantial after Dr. Engel took over was I tried to clarify the exact forms of phosphorus that Tim was using in his regression analysis.

Q Dr. Olsen, with respect to the final version of the regression analysis that forms the basis of the summary in Section 6.9, did you personally review the regression statistics? 09:52AM

A No.

Q Okay. Did you review the underlying data used in the final regression analysis? 09:52AM

A That's where I caught forms of phosphorus that were being used.

Q Okay. So you reviewed the water quality data; correct?

A Yes. 09:52AM

Q But the other piece of that, the poultry house density data, did you review it personally in preparation for writing or working on Section 6.9 of your report?

A No, but that was again independently verified. 09:53AM

Q By Dr. Fisher?

A No. Well, it was -- the numbers that Dr. Fisher used were not independently verified but the -- how those numbers were used in the basin descriptions and ultimately density per basin was 09:53AM

checked by Dr. van Waasbergen.
Q The check that you are referring to, if I understand correctly, is confirming that that data was being used in the same manner by two different experts; is that right? 09:53AM
A Yes, that they were coming up with the same density calculations per basin.
Q Right, but with respect to validating the underlying dataset on which those density calculations were performed, you weren't involved in that, were you? 09:53AM
A Not the house densities or the locations.
Q Okay. Section 6.10, entitled Poultry Biomarker, I believe you told me earlier that this was a collaborative effort between someone in your shop, yourself and Dr. Harwood; is that right? 09:54AM
A Not really. Jess -- you asked who did the first draft of this, and so Jess Jeppson took the first draft of this because she was taking what Dr. Harwood already had and summarizing it. So I don't think I ever testified it was a collaborative effort. 09:54AM
Q I'm sorry. Whose work is described in Section 6.10?
A Dr. Harwood's work. 09:54AM

Q Okay. Are you a microbiologist, Dr. Olsen?
A No, I'm not.
Q Have you ever been qualified to testify as an expert to identify source contamination using a bacteria biomarker? 09:54AM
A No.
Q Do you intend to offer opinions, if you are permitted to, at the trial of this case on the results of the work by Dr. Harwood?
A Yes. 09:55AM
Q Okay, and what do you believe qualifies you to offer those opinions?
A Again, this is part of the weight of evidence, and I can certainly use the data that was produced from here and make in my opinion conclusions from 09:55AM it. It's in this case another parameter that I would look at and evaluate in terms of locations, spatial relationships in the basin, those types of things to help support conclusions, along with its uniqueness of being a unique identifier. So those 09:55AM conclusions are important to my -- for all weight of my opinions.
Q I think what I'm hearing you say, but you tell me if I'm wrong, is that you intend to rely upon the work as opposed to testify as to the integrity of 09:55AM

the work; is that right?
A That's right, but some of the parts I was heavily involved in, like the sampling, picking samples, the sample collection and things like that.
Q On Page 6-10 of your report you refer to a bacteria mass balance analysis completed by Dr. Christopher Teaf; do you see that? 09:56AM
A Yes.
Q Who is Dr. Teaf?
A He's another retained expert in this case. 09:56AM
Q Is he a CDM employee?
A No.
Q Okay. Is he working under your direct supervision?
A No. 09:56AM
Q Okay. He's another expert retained by the Motley Rice Firm?
A That's correct.
Q Okay. In this particular section of your report it appears to me that you're reporting the conclusions of Dr. Teaf; is that fair? 09:56AM
A That's correct.
Q Okay, and Dr. Teaf has reached some conclusions regarding the relative fecal bacteria contributions in the watershed? 09:57AM

A That's correct.
Q Did you look at the underlying data that Dr. Teaf used in arriving at his relative percent contributions on Page 6-10?
A At one time I think we actually supplied some of that data to him because it was data that -- some of that data we actually collected, but I did not look at his final dataset that he used to calculate these percentages. 09:57AM
Q Did you review his computations as to how he arrived at the numbers reported on Page 6-10? 09:57AM
A Not as a check. I just reviewed what he wrote about those computations.
Q Dr. Olsen, how long has CDM been working on its -- I'm sorry, strike that. How long has CDM been working in support of Motley Rice on this case? 09:57AM
A I think my previous testimony is that we were engaged in October or November of '04. I'd have to check my -- those exact dates. I hope that's consistent with what I previously said. 09:58AM
Q Dr. Olsen, coming up on four years of work in the case; is that right?
A Yes.
Q Okay. How many employees would you estimate that CDM has had working on this project? 09:58AM

A I think I previously testified on that, too, and it was over a hundred. Again, I'd have to check my previous testimony on that and that includes, you know, secretaries and people that put in a little bit of time and things like that. That's why that number is so big. 09:58AM

Q Doctor -- I'm sorry, are you done?

A Yeah. Sorry about that.

Q I didn't mean to cut you off. Can you please identify for me, Dr. Olsen, and for the jury the specific locations where you have found contamination of either groundwater or surface water that you have specifically traced back to land application of poultry litter generated on farms under contract with my clients, Cobb-Vantress and Tyson? 09:59AM

A Yes. We have eleven, and if you count Cobb, there's twelve actual edge of field samples that had -- at the edge of fields that had -- again, that's runoff from fields at edge of field. Those samples were specifically collected runoff from Tyson-applied fields. 09:59AM

Q Okay. Let me broaden my question or actually let me narrow it, if I can. Can you identify for the jury the specific locations where you found 10:00AM

contamination of groundwater or streams or rivers that you have specifically traced back to the land application of poultry litter generated on farms under contract with my clients, Cobb-Vantress or Tyson? 10:00AM

MR. PAGE: Object to the form.

A Would you state that again, please?

MR. GEORGE: Why don't we have it read back.

(Whereupon, the court reporter read back the previous question.) 10:00AM

MR. PAGE: Same objection.

A Again, consistent with previous testimony, when you asked that question before, I've not done that and not been asked to do that. 10:00AM

Q Okay. So do I understand, Dr. Olsen, that none of your opinions regarding the source of contamination of specific locations of groundwater, stream water or lake water are specific to my clients, Cobb-Vantress or Tyson? 10:01AM

A That's right, but --

Q And, Dr. Olsen, if I asked the same two last questions for each of the defendants that are named in this lawsuit, would your answers be the same?

A That's right. 10:01AM

Q Let's take a break and change the tape.

VIDEOGRAPHER: We're now off the Record. The time is now 10:01 a.m.

(Following a short recess at 10:01 a.m., proceedings continued on the Record at 10:08 a.m.)

VIDEOGRAPHER: We are back on the Record. The time is 10:08 a.m.

Q Dr. Olsen, earlier you identified some of the CDM team members who authored parts of the report, do you recall that, listed off different folks? 10:07AM

A Yes.

Q Okay. Have those employees, for example, Brian Bennett, Ron French, Drew Sabatini (sic), Jessica -- what's Jessica's last name? 10:08AM

MR. PAGE: Jeppson.

A Jeppson, and it's Santini, S-A-N-T-I-N-I.

Q Have those individuals gathered up their file materials, including any E-mail files that they may have, for production as part of your considered materials? 10:08AM

A Anything done independent of me they've not produced, but every E-mail and every file that they produced for me or E-mail they sent to me or I sent to them has been produced. 10:08AM

Q So if they sent something to you or provided you with a piece of material, that would have been included in your production; correct?
A Yes, sir, any E-mails from me to them was produced, too. 10:08AM
Q I assume that each of these individuals have their own office and own computer and their own internal files; is that right?
A That's correct.
Q Have those sources of information been mined for work product related to this case? 10:09AM
A No.
Q Okay. Do you know why not?
A Because I'm the expert and everything comes through me that I need to support my opinions, and all my considered and relied upon material has been produced. 10:09AM
MR. GEORGE: David, I'm going to call for the production of the files and E-mail correspondence, working drafts and material that are in the possession of these other CDM employees who had a role in the drafting of the expert report. 10:09AM
Q Dr. Olsen, can you turn to Table 6.4-2A of your report. By the way, could you have made these tables any more difficult to identify by number? 10:10AM

Those are long table numbers. Couldn't we have just used A, B, C, D?

A Well, that would have been constantly changing, so we did it by section.

Q Okay. Table 6.4-2A, entitled Chemical and Bacterial Compounds of Poultry and Cattle Waste, open paren, Water, closed paren; do you see that? 10:10AM

A Yes.

Q Generally what is this table?

A This particular table summarizes water samples that were collected in the basin. This particular one summarizes three different types of waters. 10:10AM

Q Dr. Olsen, it appears to me -- I'm sorry. Were you through?

A Go ahead. I was just going to describe it more. There's some related to poultry and there's some related to wastewater treatment plants. 10:11AM

Q Where do you see wastewater treatment plants on Table 6.4?

A Oh, I'm looking at B. Sorry. Thank you. 10:11AM

Q You're welcome.

A Get back to A. Okay.

Q Hang on. Let's clear up the Record here.

A You --

Q Hang on. Dr. Olsen, do you have in front of 10:11AM

you Table 6.4-2A?
A Yes.
Q And it is entitled Chemical and Bacterial Compounds of Chemical and Cattle Wastewater?
A Yes. 10:11AM
Q All right. Now, provide us a brief description of this table.
A Again, it's a summary of a number of samples, a variety of kinds related to poultry and related to cattle. 10:12AM
Q Okay. I notice under the grouping of columns beneath the heading poultry -- do you see that area of the table?
A Yes.
Q There's a reference to edge of field samples? 10:12AM
A Yes.
Q Okay. What are those?
A Those are the -- again, described in this section exactly how we collected, but in summary, those are collected after rainfall events where 10:12AM water would run off from fields where there was documented land application of poultry waste.
Q Okay. So do I understand correctly that you believe that the edge of field samples listed under this heading of poultry bears some relationship to 10:12AM

the land application of poultry litter?
A Yes, I do, and Bert Fisher actually reviewed all these locations and verified they were representative of runoff from land applied fields.
Q The second half of the chart on the right-hand side is under the heading cattle; do you see that? 10:13AM
A Yes.
Q And, again, there's a reference to edge of field samples; do you see that?
A Yes. 10:13AM
Q And can you provide the court with a description of what the cattle edge of field samples are and are intended to represent?
A Yeah. That's actually a misnomer, edge of field, in my opinion. Those were collected this spring. We were out -- CDM and Lithochimeia were sampling actual cow manure samples, and it was raining, and so after that rainstorm, my understanding that two samples were collected on one of the fields from -- one was from a ponded water 10:13AM 10:14AM near the road and another one was from runoff a little bit further up on the field, so they weren't our classical edge of field runoff as the poultry edge of field. They were kind of opportunistic samples from a field that had cow manure on it. 10:14AM

Q Okay. Were they -- I'm sorry, strike that. Was the intent of these samples under cattle edge of field to capture runoff that would be representative of a pasture where cattle had been grazed?

A That was the intent, you know, but after looking at actually what was done and the location of discrete cow pies on field, that's a pretty difficult thing to do. To get a sample that was representative of runoff and document that there wasn't anything else but cows, that's extremely difficult. 10:14AM 10:15AM

Q Well, did you try to document that?

A Yes, we did.

Q Okay, and have you reviewed the field notes associated with this particular sampling event? 10:15AM

A Yes.

Q And have you reviewed the photographs taken on site?

A No, I haven't done that. I was going to do that but didn't get around to doing that yet. 10:15AM

Q Whose property were these cattle edge of field samples taken from?

A This is Mr. Fife's (sic) property.

Q Do you know who Mr. Fite is?

A Yes. 10:15AM

Q Who is he?
A I think he works for the -- what's the organization?
Q Is he the administrator of the Oklahoma Scenic Rivers Commission? 10:15AM
A Yeah, yeah, administrator or executive director or something, position like that, right.
Q And do you recall from your review of the field notes associated with the cattle edge of field sampling that Mr. Fite reported and it was recorded 10:16AM in the notes that no poultry litter had ever been applied on those pastures?
A That he was aware of.
Q Well, he was the owner of the property; right?
A Yes, but I don't remember him associating a 10:16AM time frame with that or anything. So I don't know how long he's owned it or what happened before that, but maybe he's owned it, you know, for a long period of time.
Q Do you have any evidence that poultry litter 10:16AM was ever applied on that property?
A No, I don't but, again, the samples were collected in an area that has other fields in it. One sample is very near a road where dust could have blown off trucks, which we've seen, or dust could 10:16AM

have accumulated on the field from other application fields. There's also a spring upgradient on his field that is heavily contaminated that has a fracture pattern that leads to poultry applied fields. So the water from that spring could run that way. I've not been able to document that for sure, though. So there's other ways that poultry waste could have been -- ended up on the field. 10:17AM

Q Dr. Olsen, you used the results of the cattle edge of field samples in your analysis in your report to support comparisons between impacts associated with cattle and impacts associated with poultry, do you not? 10:17AM

A That's right.

Q All right. In light of the fact that you've used those edge of field samples to represent cattle impacts on surface water, are you now disclaiming those samples as being somehow unrepresentative of cattle impacts? 10:17AM

A Well, I'm saying we need to use those two particular samples with caution because they don't match specifically some of the compositions reported by these other things related to cattle, like the actual synthetic leachates or springs that were actually impacted. Some of the parameters do, some 10:18AM

of them don't. So, yes, I'm cautioning the use of those as how representative they actually were because they were ponded and these other things I've explained.

Q Show me in your report where you cautioned against the use of those samples as being representative of impacts from cattle. 10:18AM

A I don't think I ever discussed that.

Q Okay. How many cattle edge of field samples are shown on Table 6.4-2A? 10:18AM

A Two.

Q Okay, and, Dr. Olsen, are those the only two samples that CDM collected from an area that it believed to have the presence of cattle and the absence of poultry litter? 10:19AM

A Those fields were extremely hard to find. So these were the only two that were collected. There's again the springs. We were able to document a couple of springs that we believe were only cattle impacted. 10:19AM

Q And, in fact, the cattle impacted springs are shown on Table 6.4-2A; correct?

A Yes.

Q Okay, and how many samples were taken from springs that you have identified as being impacted 10:19AM

by cattle manure?
A I reviewed all the logs on there, and I think there was nine or ten, maybe up to twelve, that had potential or maybe contamination, but these were the two that were identified. One was identified as for sure and so I selected that one, and there was another one that was identified highly probable. So those are the only two that I really picked that we knew that, you know, they were cattle, had cattle contamination in them for sure. 10:20AM
Q So, Dr. Olsen, do I understand then that these two samples for cattle impacted springs are the two that you have confidence in as showing the impact of cattle manure on springwater?
A Yes. Specifically there's one there that was -- they described as for sure had -- you know, I think there was actual, you know, cow waste in the stream. 10:20AM
Q Okay. Can you identify by sample name or number the two cattle edge of field samples and the two cattle impacted springs? 10:20AM
A Yes.
Q Could you do that for me?
A It's in the report. May I look at the report?
Q Yeah. Could you turn to Page 6-62? It may be 10:20AM

somewhere else as well, but I think it's there.
A Yeah, there are four listed there on Line 1, 2, 3, 4, 5 -- Line 5 and 6.
Q Could you read for the Record, Dr. Olsen, the sentence that contains those four references? 10:21AM
A The four sample documented with cattle contamination are SPR-LAL16-SP2, SPR-26EOFCP-1B and EOFCP-1A.
Q And you're not disagreeing today, are you, Dr. Olsen, with your statement that those four samples 10:21AM are documented with cattle contamination?
A You know, you have to review all the records. I'm cautioning that the CP1B and 1A just because it's different with cattle than poultry. Poultry waste is evenly spread over a whole field and so 10:22AM when it rains and there's runoff, you're going to get poultry contamination. It's much different with cattle.
Q How so?
A Because there are discrete patties. Some of 10:22AM them are old dry patties that don't leach as much, and so like the one sample -- particularly if it was just a ponded water, it may not even hit a cow pattie. Who knows? So getting a representative sample and saying that that's really representative 10:22AM

of cattle runoff from a cattle field is much more difficult than it is from a poultry field, and that's why I'm using those with caution today.

Q It sounds like to me, and you tell me if I'm wrong, that based on that qualification, your concern is that you may be less likely, not more likely, to find contamination in an edge of field sample taken from a cow pasture; did I understand? 10:22AM

A Less likely to find contamination?

Q Is that the point? 10:23AM

A Yes, that's a point, yeah.

Q So you're not disagreeing -- well, strike that. Let's move on. Now, let's go back to Table 6.4-2A. How many poultry related edge of field samples did CDM collect? 10:23AM

A I'd have to go back to Section 2 to get the total amount.

Q Okay. If you need to go there, please do.

A The bottom of Page 2.9 under Sampling Summary, it says they were at a total of 89 edge of field samples collected. 10:24AM

Q And are all 89 of those related to areas where poultry litter has been applied; was that the goal?

A Yes.

Q Okay, and for purposes of your analysis, 10:24AM

you're assuming that those edge of field samples show the impacts of poultry litter application; is that right?

A There's a variety in concentration, and that actual amount of impact varied depending on how recent the application occurred, how intense the rainstorm was and a variety of things. There's a large range in concentration. Overall they are representative showing impact of poultry contamination in my opinion. 10:24AM

Q Okay. Turn to Page 1-1 of your report, Dr. Olsen. Do you see in the second bullet point where you say or offer the opinion that the sampling approaches used in this case are appropriate to identify all major sources and causes of contamination in the Illinois River watershed, including evaluations of impacts from cattle waste, poultry waste and wastewater treatment plants; do you see that? 10:25AM

A Yes. 10:25AM

Q Do you still believe that's true?

A Yes.

Q You believe that the approach in this case led to the type of environmental samples that are representative of those sources and sufficient for 10:25AM

analysis in this case?
A Yes, I do.
Q Okay. Do you agree, Dr. Olsen, that the scientific method -- you're familiar with the scientific method; correct? 10:26AM
A Yes, sir.
Q Okay. Do you agree that the scientific method required the Motley Rice experts to be open to the conclusion that sources other than poultry were responsible for the contamination alleged in this 10:26AM case?
A Yes.
Q Okay, and do you agree that to be scientifically defensible, it is important that CDM's sampling approach in this case be set up to 10:26AM capture sufficient data to evaluate contamination from sources other than poultry litter?
A Yes.
Q Okay, and you collected 89 edge of field samples in areas where you believed you would find 10:26AM the impact of poultry waste; correct?
A That's both poultry and cattle waste. As we know, there's cattle on all those fields and so those were collected, any cattle waste that ran off of that field, too. 10:27AM

Q Let me back up the train for a second and make sure I understand. Are you telling the court, Dr. Olsen, that the contamination that you see in the edge of field samples, the 89 edge of field samples that you've listed under poultry on Table 6.4-2A could come from cattle as well as poultry?

A There is potential that there's some cattle in it. It's -- in my opinion in my evaluations it's insignificant compared to poultry.

Q How many of those 89 edge of field poultry samples are also contaminated with waste from cattle?

A I did not try to document that. I mean, we looked at the chemical contamination and verified that cattle contamination in runoff is distinct from poultry contamination, and if the cattle contamination would have been there in a significant quantity, it's distinct enough we would have seen it. So that relates back to my opinion that we would have seen the impact of cattle waste based upon the sampling that we did, both the edge of field and in the environment. If it's a major source, we would have picked it up.

Q Well, did you see?

A What's that?

10:27AM 10:27AM 10:27AM 10:28AM 10:28AM

Q Did you see it?
A We saw it in a few samples, but it was not major enough to create its own distinct signature in the basin.
Q Well, how many of the 89 samples did you see the effects of cattle in your analysis? 10:28AM
A It was not dominant in any of those samples.
Q Was it present in all the samples?
A I don't know. I didn't look specifically, but it wasn't a dominant signature that was created in those runoff at all. 10:28AM
Q What do you mean by dominant?
A It wasn't the major composition of the waste source at all. It wasn't identified as a major component or signature component at all in those edge of field samples. 10:29AM
Q What do you mean by major?
A Dominant, you know, scientifically it's greater than 50 percent of composition, but these compositions were -- you know, I never did try to put a number with it, but based on my mass balance calculations, we can go through there parameter by parameter but, you know, for copper, it's going to be a very minor percent. I think I calculated typically less than 1 percent, if any, would be 10:29AM

related to cattle, you know. There just isn't any copper in cattle waste. The phosphorus, you know, it may range from, you know, 10 to 15 percent in those samples, but in my opinion, that's an overestimate of how much phosphorus is really from the cattle in those waste samples. 10:29AM

So, you know, there's a whole section on my evaluation of how much mass would actually be in those types of samples, and that's why we did the synthetic leachates, to try to figure that out, but it was a very small fraction, you know, typically less than 10 percent, except for some of the bacteria. Those were higher. You know, those were in the 30 to 40 percent. 10:30AM

Q Dr. Olsen, if you now concede that some of the edge of field samples are cross contaminated with cattle manure, then why did you portray them in Table 6.4-2A under the heading poultry edge of field? 10:30AM

MR. PAGE: Object to the form. 10:30AM

A I did not say they were cross contaminated. I said they were -- potentially contained some minor parts of cattle.

Q How is that different from cross contamination? 10:30AM

A We didn't contaminate them -- we didn't cross contaminate them by any sampling procedure or anything at all. Cross contamination is usually related to a sampling procedure that you've added something that you weren't supposed so. In the scientific literature, that's what cross contamination would be.

Q Well, my question took us off track. Let me see if I can get us back where we were.

A That's all right. 10:31AM

Q Dr. Olsen, you do concede that some of the edge of field samples on Table 6.4-2A that you have described as poultry contained concentrations of each or some of these parameters that actually derive from cattle manure? 10:31AM

A Potentially very small portions. Those are mostly poultry, and that's what was documented in the field. We did not try to document cattle on the field. I'm just saying there's a potential that some of that had minor parts of cattle in those samples. 10:31AM

Q So given that acknowledgment, Dr. Olsen, are the 89 edge of field samples that you've described as poultry representative of the impacts of just poultry or poultry and cattle? 10:32AM

A They're representative mostly of poultry. Some of them may have some cattle impact, but as I described in there and other experts have described, it's an extremely minor part of that contamination.

Q All right. Dr. Olsen, with respect to Table 6.4-2 where you compare 89 edge of field samples that you have labeled as poultry with two cattle impacted edge of field samples, do you believe that that comparison is sufficiently robust to draw scientifically valid conclusions, 89 versus two? 10:32AM

A I did not make those types of comparison. This is just reporting the data.

Q I believe you told me that Motley Rice first collected these two cattle edge of field samples in the spring of this year; is that right? 10:33AM

MR. PAGE: Object to the form.

A I don't think Motley Rice collected these samples.

Q Oh, thank you. I believe you told me that CDM personnel working under the direction of Motley Rice collected the cattle edge of field samples in March of 2008; is that right? 10:33AM

MR. PAGE: Object to the form.

A Again, we weren't working under the direction of Motley Rice. You know, it was Lithochimeia 10:33AM

personnel that were out there under the direction of CDM.

Q Okay. When is the first time that anyone working for the team of experts that Motley Rice has assembled for this case set out to collect an edge of field sample from a location that had only received cattle manure and not poultry litter? 10:33AM

MR. PAGE: Object to the form.

A We never did set out to collect them because it was going to be difficult. We were out there collecting cattle manure in the spring and we had already collected cattle manure, but it had never been collected specifically for the complete suite of chemical composition, and that was what we were out there for. It happened to rain, and so they happened to -- the team happened to pick up these two samples that were, you know, after the rainstorm on the field. So it wasn't a specific objective of the sampling at all. 10:34AM 10:34AM

Q CDM never had a specific objective, did it, to collect edge of field samples that would be representative of cattle manure impacts without poultry? 10:34AM

A No. The overall scheme was that the cattle waste is distinct enough that all the ambient 10:34AM

samples we collected, including the edge of field in the environment, if cattle waste is a major component, you would have seen it, and that's consistent with scientific sampling and statistical type analysis, that you'll be able to see that because it is distinct. So, you know, we really didn't need to collect anything except what's in the environment, the ambient environment, and automatically if it's major components and they're distinct enough, you'll be able to see that. 10:35AM

Q Why did you specifically target edge of field samples in areas where poultry litter has been applied? If you can just see it in the samples, why did you set out to specifically gather edge of field samples to show the effects of poultry litter? 10:35AM

A Again, we were trying to get each and document each environmental component from land applied fields, and as I already said, there were cattle on a lot of those fields, too, so it wasn't specifically -- if cattle would have been the dominant, we would have seen it in the edge of field and in the rest of samples. 10:35AM

Q Dr. Olsen, did CDM collect a single groundwater sample from a location that was selected because it was believed to show potential influence 10:36AM

of septic systems on groundwater?
A No, we did not try to go to a septic tank and collect specific samples related to leaking septic tanks.
Q You never specifically selected a groundwater sampling location because it was close to a septic tank, did you? 10:36AM
A No.
Q Okay. Did CDM collect a single edge of field or stream sample from a location that was selected due to its proximity to land applied biosolids? 10:36AM
A No. Again, I have to go back to the magnitude of environmental samples that we collected in the ambient environment, and if you have a major source, and it's distinct like we showed here, we would have found and been able to distinguish those sources in the environmental samples. 10:36AM
Q So, Dr. Olsen, you believe you would have been able to see the impacts of biosolids even if you didn't sample in close proximity to where biosolids are applied? 10:37AM
MR. PAGE: Object to the form.
A If it's a major component in the surface water and lake samples, yes, we would have been able to see it if it's distinct enough. 10:37AM

Q Wouldn't its distinctness depend to some extent on how close you were in your sampling locations to where biosolids were land applied?

A No. Every waste has its own distinct characteristics. 10:37AM

Q And it's not attenuated as it moves through the environment; is that your opinion?

A No. That isn't what I said, and I don't think you listened to what I said. The chemical composition in most of those wastes are distinct. 10:37AM We didn't collect biosolids themselves, but typically they would be distinct from cattle manure, distinct from poultry manure.

Q Where is your analysis to show that?

A That's just based on my knowledge of what biosolids look like. 10:37AM

Q Have you evaluated a single sample of biosolids in the Illinois River watershed?

A No, but, again, the amount of biosolids that have been disposed in locations where those are disposed are well controlled. Those are under regulations, and in my opinion, because they're under regulations, would not impact any significant surface waters and groundwaters in the basin. 10:38AM

Q Dr. Olsen, tell the court what you know about 10:38AM

the amount of biosolids that are land applied in the basin.

A I do not know for sure. Not much but, again, those are regulated, and I assume because they're regulated, they are disposed in places that would not impact surface waters and groundwaters. 10:38AM

Q Are you aware that poultry litter is regulated?

A There's no range -- well, poultry litter is regulated in terms of -- recently in terms of waste application as for amount that you can put on the fields as I understand. 10:39AM

Q So I assume from your statement earlier that you would believe that poultry litter under the current regulatory regime is being applied in locations that are proper? 10:39AM

A No.

MR. PAGE: Object to the form.

Q You don't assume that?

A No. That's not correct. 10:39AM

Q Okay. So you rely on the regulatory system with respect to biosolids but not poultry litter; is that fair?

A No, not at all. I know -- I've been familiar with some of the biosolids regulations and the 10:39AM

concentrations and where they have to dispose of them. So those are a much different set of regulations than poultry waste.

Q Where are the locations that biosolids can be applied or have been applied in this basin? 10:39AM

A I do not know that.

Q You can't identify a single location?

A I do not know that.

Q But you've excluded them as a source in your analysis? 10:39AM

A Again --

Q Have you excluded them as a source?

MR. PAGE: Objection. Allow the witness to answer, please.

MR. GEORGE: He's not answering. 10:40AM

MR. PAGE: He was answering the question. You interrupted him.

Q Dr. Olsen, please answer my question.

A I've not done the specific analysis of that particular source. 10:40AM

Q In light of --

A And I don't believe it is a significant source.

Q But can you provide me any basis for that?

A I could if given enough time and asked to do 10:40AM

that.
Q You weren't asked to evaluate biosolids, were you?
A No.
Q You weren't asked to investigate them as a potential source, were you? 10:40AM
A No, I was not.
Q Dr. Olsen, did CDM collect a single stream sample from a location that was selected because it was believed to show the potential influence of runoff from developed urban areas? 10:40AM
A There's many samples that have potential for runoff from urban areas.
Q Well, did CDM set out to identify those specific sources, runoff from urban areas, and design a sampling program to evaluate that? 10:41AM
A No, but we ended up with lot of samples that have wastewater impact and urban area impacts in them probably.
Q Just happened to get those in the overall dataset? 10:41AM
A Well, when you set up systematic sampling schemes that are stratified in random, you get good data that's appropriate to evaluate sources.
Q Which samples show the effects of urban 10:41AM

runoff?
A Well, I have the onces that are associated with wastewater treatment plans. I didn't specifically look at the ones that would be with urban, but I assume that the ones that have wastewater treatment plant are in the same areas that may show urban impact, too.
Q You believe the urban area of dense human population in northwest Arkansas is limited to the area in which the wastewater treatment plant operates? 10:41AM
MR. PAGE: Object to the form.
A Particular wastewater treatment plants are associated with the urban areas in my opinion, and I know Bernie Engel has looked at that specifically. Again, urban runoff is a small percentage of his phosphorus balance. 10:42AM
Q Dr. Olsen, you did not evaluate any of the sampling data that was generated by CDM in this case with a specific eye towards capturing the effects of urban runoff, did you? 10:42AM
MR. PAGE: Object to the form.
A Again, if it was a major source, we would have been able to identify that, and we did not try to specifically identify that because we didn't see 10:42AM

that a different -- another source besides wastewater and cattle in our analysis. I mean, if we would have seen a different source besides that, we would have looked at it more thoroughly.

Q Dr. Olsen, did CDM collect a single stream sample from a location that was selected because it was believed to show the potential influence of stream bank erosion? 10:42AM

MR. PAGE: Object to the form.

A Well, all the samples in the stream had the potential to have stream bank erosion. 10:43AM

Q Can you point me to samples that show the effects of stream bank erosion?

A Again, it's a small -- in our opinion it's a small effect, so it's not in my evaluation. 10:43AM

Q Dr. Olsen, how do you know it's small if you don't evaluate it?

MR. PAGE: Object to the form.

A There's no evidence that -- in my opinion that stream bank erosion created a significant impact on the sediments in the basin or on the water quality. 10:43AM

Q Did you attempt to gather evidence to show that stream bank erosion does have an effect?

A You know, in my opinion we didn't have to. If it was a distinct different source, we would have 10:44AM

seen it in the analysis because we had lots of stream samples and, again, that is the same thing. You collect ambient -- you collect ambient samples and you see what the sources are from that, and that's what we did, and we did not see any distinct samples that would have been, in my opinion, related to stream bank erosion.

Q Dr. Olsen, tell the court what you did to evaluate the stream samples that you had to determine whether or not they showed the effects of stream bank erosion.

A There wasn't any distinct group that was different from samples that didn't have stream bank erosion in them. They were all in the same group, so there was no distinct difference that showed any impact from stream bank erosion. I mean, all the base flow samples and all the high flow samples, you know, they were all in one group, and so there wasn't any difference under high flow, whether it be bank erosion, and whether there was base flow and there wouldn't be any bank erosion. So they all grouped together in the chemical analysis and chemical signature, so there wasn't any difference.

Q Couldn't it be because all the samples showed the effect of stream bank erosion; that's why they

10:44AM 10:44AM 10:44AM 10:45AM 10:45AM

all grouped together?
A Base flow would not show any effect of stream, stream bank erosion.
Q Was there no difference in the chemical composition between base flow and high flow samples in your dataset? 10:45AM
A There was, but they all grouped together in the same pattern.
Q What's that pattern?
A That's the Principal Component 1 pattern. 10:45AM
Q Dr. Olsen, you said you would have seen the stream bank erosion effect in your analysis. How would you have seen it?
A If it was different and distinct, we would have seen a different impact on the chemical composition during high flow versus base flow. 10:46AM
Q What would you have expected to have seen in terms of a different composition?
A You know, stream banks would have had more iron, more aluminum, you know, generally more highly elements that are in the sediments. 10:46AM
Q Okay.
A More silica. You know, we didn't analyze for silica. So more iron, more aluminum. We would have seen those types of things. 10:46AM

Q Did you evaluate those samples for iron and aluminum concentrations to determine whether stream impact -- I'm sorry, stream bank erosion may be having an effect on those samples?

A That was all in the principal component analysis, so it would have related to a change in chemical composition that in my opinion you would have been able to see if it was major. 10:47AM

Q Dr. Olsen, you said you would see more of those constituents than otherwise if stream bank erosion was having an effect. Did you establish a baseline to compare those samples to? 10:47AM

A That's what base flow is.

Q Your baseline is base flow?

MR. PAGE: Object to the form. 10:47AM

A Well, what do you define as baseline?

Q Well, for purposes of analysis on stream bank erosion, what is the baseline for concentrations of aluminum and iron that you used in your analysis?

A Again, I was comparing base flow with high flow. So I wouldn't know. I guess you could call base flow baseline. That's -- that would be a sample without any major stream bank erosion in it. 10:47AM

Q With respect to urban runoff, let's go back for a moment. You said you would see it in the 10:48AM

analysis; is that right?
A If it's distinctly different --
Q What would you --
A -- in chemistry.
Q I'm sorry. I'm talking over you. Dr. Olsen, what would you have expected to have seen to identify the effect of urban runoff in high flow or base flow samples? 10:48AM
A It may -- depending on where it is, it's going to have, you know, some phosphorus. It's going to have some of the other chemicals that we looked at, and that's why we did this long list, so that we could distinguish different components. Specifically, you know, I'm -- I wouldn't know for sure what would be different between that and some of the wastewater samples. 10:48AM 10:49AM
Q How would you find it if you don't know what the differences would be?
A Well, again, if it's a major component, it's going to show up in the analysis because of the extensive list that we did. We would have hit major components of a waste -- I mean, any runoff, including urban runoff, has its own major anion and cadion and metal analysis. We analyze for all of those, and in my opinion if it would have been 10:49AM 10:49AM

impacted enough because of that, we would have seen it because that -- in my opinion that major cadion and anion analysis would probably have been different enough.

Q Dr. Olsen, you're counting on the PCA to identify those as a major source; is that what you're referring to? 10:49AM

A That and, you know, the other -- mainly the PCA, right.

Q Dr. Olsen, did CDM take a single sample of urban runoff in order to compare the chemistry that's found in urban runoff with the rest of the data sampling set? 10:50AM

A Again, as I've already said before, we're collecting mainly ambient samples, and we don't try to collect every type of source out there that was there because if it's a major impact, we're going to see it in the ambient samples. So we did not specifically try, you know, to go to municipal solids samples source. We didn't go to urban runoff sample. We went and collected ambient samples and saw the major influence of waste in those samples. 10:50AM 10:50AM

Q So, Dr. Olsen, do I understand that you can't point me to a single sample that you believe is representative of the impacts of urban runoff? 10:51AM

MR. PAGE: Object to the form.
A That was a statement. Is it a question?
Q I asked whether you agreed with my statement.
A I didn't hear that. Do you agree with --
Q Let's try it again. Can you point me to a single sample collected by CDM that you believe is representative of the impacts of urban runoff? 10:51AM
MR. PAGE: Object to the form.
A I did not analyze the dataset to see if there were -- are ambient samples that had a dominant impact of that, and I didn't need to because, I mean, we didn't distinguish any distinct group that would show that urban impact had a big enough impact. 10:51AM
Q So is the answer to my question no? 10:51AM
A I cannot at this point in time point you to a sample that is impacted by urban runoff.
Q Dr. Olsen, did CDM collect a single edge of field groundwater or stream sample from a location that was selected due to its proximity to land applied hog effluent? 10:52AM
A That was edge of field what?
Q Edge of field, groundwater or stream sample.
MR. PAGE: Object to the form.
A Again, it's the same answer as the previous. 10:52AM

We collected ambient samples and those same patterns in the ambient samples. So I don't know if any of these were near a hog farm or not. We did not specifically locate -- I mean, we went to hog farms and collected waste from hog farms, and they were pretty few and far between if I remember. They were hard to find. So there isn't that much in the basin.

Q So you knew where the hog farms were or some of them were; correct? 10:52AM

A Yes, some of them.

Q And you could have sampled edge of field runoff from those properties, couldn't you?

MR. PAGE: Object to the form.

A Most of those were CAFOs. Those were contained facilities. I don't know if there's free ranging hog farms in the basin that you would have runoff samples from. Most -- the waste samples we collected were, you know, contained. 10:53AM

Q What happens to the waste from a hog farm? 10:53AM

A You know, as far as I know, it goes into lagoons.

Q Where does it go after it goes into the lagoon?

A Some of that may go into groundwater, yeah. 10:53AM

Q Are you aware of the fact that lagoon water is used for irrigation on hog farms?
A I'm not aware of that fact.
Q Okay. You didn't sample any hog farms, did you? 10:53AM
A No, I did not but, again, I've reviewed the chemical analysis of hog farm waste and, again, that's distinct enough that we would have seen it in my opinion in the ambient samples that we collected, and we didn't. 10:53AM
Q What was -- I'm sorry. What would you have seen?
A I'd have to go back and review those articles. I just remember reviewing them.
Q Did you sit down with the chemical data and look for the effects of hog effluent? 10:54AM
MR. PAGE: Object to the form.
A I remember looking at the chemical composition and actually looking at some wells that were impacted in other studies by that, and in my recollection, remembering that's a different type of impact than we're seeing. 10:54AM
Q How's it different?
A Again, I don't remember without going back and looking at those specific articles. 10:54AM

Q Do you recall ever looking at the results of a single sample collected in this investigation, Dr. Olsen, and asking yourself could this be representative of the impacts of hog effluent?

A No, I don't ever remember doing that nor do I believe I had to do that. 10:54AM

Q Dr. Olsen, isn't it true that CDM assumed from the very beginning of its investigation that the only two potentially significant sources of contamination in this watershed were poultry litter and wastewater treatment plants? 10:55AM

MR. PAGE: Object to the form.

A No.

Q Can you point me to a single SOP or sampling program that was designed to target for investigation sources other than poultry litter and wastewater treatment plants? 10:55AM

A Again, as I've said, those were all in most cases sampling plans for environmental ambient samples that would have picked up the effects of all waste. 10:55AM

Q If that was the case, why did you need a plan specific to poultry litter?

A Well, we knew that it was an identified source and, you know, that's who the lawsuit is against, 10:55AM

the poultry operators, and we knew the magnitude of that source.

Q When you're hired as a consultant in connection with litigation, you don't just target for investigation the defendants, do you? 10:56AM

A No, but in this case we knew that that was a large quantity that had been disposed and it was, of course, reported in a lot of literature that it's a significant source in the basin.

Q You knew that before you ever started your investigation; right? 10:56AM

A I didn't know it was a significant source. I read it in the literature that it was, and we went out and collected ambient samples throughout the environment. 10:56AM

Q Dr. Olsen, we've talked a little bit about edge of field samples. Did CDM or its field personnel measure the flow or the amount or volume of water running off in the area where edge of field samples were collected? 10:56AM

A They did not measure the volume. They would typically note, you know, flowing water. I don't know if they ever estimated volumes or not.

Q There are in fact devices and procedures that are available to measure flow in an edge of field 10:57AM

sample, aren't there?
A Yes, there are.
Q And you have had experience in using those in other investigations; is that right?
A To measure flows? 10:57AM
Q Yes.
A Yes.
Q Okay. Why didn't you do that in this case?
A It takes -- we were -- that takes a lot of instrumentation, a lot of digging on fields to 10:57AM channel into a collection device. We did not have access to fields.
Q How did you sample if you didn't have access to fields?
A We selected from the edge of fields. 10:57AM
Q You couldn't dig there?
A Well, a lot of times it was more sheet runoff, and you have to get into the fields to channel it. In some cases there may have been a place that we could have put it in the ditch. 10:58AM
Q Dr. Olsen --
A I'm trying to see where -- it wasn't that -- given the difficulty in, you know, it wasn't that relevant to the analysis. The concentrations were, and it would have been a good piece of data to have 10:58AM

to document mass loads, but it would have been extremely difficult to get that exact type of data because of what I described, and typically to get flows, you have to create good channels, you know, like we had at the twelve locations. We did collect flows there, and you have to have good channels. You have to -- in the case of runoff from small or large areas, you have to be able to channel all the water to the area. You have to build a flume in those cases or you have to have a large channel with a continuous type recorder. These you typically would have done a lot of excavations and flumes to direct the water to the particular location. 10:58AM 10:59AM

Q You said you had channels at twelve locations. What twelve locations are you referring to? 10:59AM

A We constructed -- that was a high flow, small tributary high flow stations where we did have flow recorders.

Q Okay. Did you actually construct a channel or was it just a natural channel? 10:59AM

A Well, we made sure the channel was appropriate and that that channel was surveyed or we couldn't have got flows. In some cases the channels weren't -- weren't -- weren't -- weren't good enough and smooth enough. I'm just referring to when I 10:59AM

said to construct a channel, you usually have to do that in a lot of places. Like the edge of field, you would have had -- if it's a large flow off, you would have had to create a smooth channel where you could get a rating curve for it to estimate curves. 11:00AM

Q So, Dr. Olsen, with respect to some of the high flow stations, you actually did move earth and create a channel; is that right?

A No, I didn't testify to that.

Q I misunderstood.

A I said that's what you would have had to do if you wanted to get a flow measurement.

Q Okay. Did you do any of that?

A No.

MR. PAGE: Object to the form. 11:00AM

Q And with respect to edge of field samples, no flow measurements were recorded; correct?

A I'd have to review all the notes. They may have made an estimate of flow once in a while but that wasn't what they, you know, typically did in 11:00AM getting these edge of field samples.

Q Dr. Olsen, would you agree with me that for purposes of evaluating the impact on a receiving water body, there are two critical pieces of information, one is concentration and the other is 11:00AM

flow?
A If you're going to impact -- if you're going to get a load, and that's exactly what Dr. Engel's model did. Just because it was so difficult to physically get that type of data, he has a model that does that load calculation based on a lot of scientific investigations and evaluations. So that's in his model to predict that load. 11:01AM
Q What did he do to validate that?
A You'd have to ask him. 11:01AM
Q Okay. You didn't try to validate it through your sampling program by actually capturing flow data; correct?
A No. Again, that's a very difficult thing to do. 11:01AM
Q Okay. Earlier on several occasions in describing the CDM sampling program, you stated that CDM collected ambient samples. What do you mean by that?
A That's a word that's used in the literature. 11:01AM In fact, the environmental forensic handbook or environmental forensic textbook that's been quoted off and on in my testimony uses that word to reflect non-source type samples of specific sources that are actually in the environment. So I think legally 11:02AM

someone would use a different term for ambient than that, but that's what I'm referring to because that's particularly what -- that textbook refers to ambient samples. In fact, that textbook says that that's how you should set up a program to identify sources. You should collect ambient samples. 11:02AM

Q So not directly related to a particular source but just locations in the environment; is that right?

A Yes, yes. 11:02AM

Q Do you consider your poultry edge of field samples to be ambient samples?

A They're in the environment, and they were collecting runoff in this case that contained whatever was there. I already said it contained some cattle and some -- and some cow and mainly poultry in my opinion, and we did analysis with and without those edge of field samples in there to see the effect and the conclusions we make, and essentially the conclusions were the same, with and without those types of samples. 11:03AM

Q You said a lot but I'm not sure I heard the answer to my question. Do you consider the edge of field poultry samples to be ambient samples?

A Ambient in that they're in the environment but 11:03AM

they're close enough to a source that they represent the source, but not totally one source as we've already talked about. So they're kind of in between.

Q But they could represent multiple sources; is that fair? 11:03AM

A Yeah, uh-huh.

Q Let's take a break.

VIDEOGRAPHER: We are now off the Record. The time is 11:04 a.m. 11:04AM

(Following a short recess at 11:04 a.m., proceedings continued on the Record at 11:15 a.m.)

VIDEOGRAPHER: We are back on the Record. The time is 11:15 p.m. 11:15AM

Q Dr. Olsen, would you turn to Page 1-1 of your report. In the fifth bullet point, Dr. Olsen, you say that the laboratory data are accurate, precise, representative and comparable and can be used for intended purposes and evaluations, and then you refer to an EPA recommended completeness goal of over 90 percent. Do you see that? 11:15AM

A Yes.

Q Okay. What is the EPA recommended completeness goal; what is that? 11:16AM

A It's a goal that you have 90 percent of the data you collect is complete, and what they mean by complete here is that it's not rejected; it's usable.

Q Rejected by who? 11:16AM

A In this case, you know, by the reviewers.

Q Who would the reviewers of the data be in this case?

A In this case we did -- well, the lab does reviews and then we supplement that review by doing 11:16AM our own independent review of the data quality and qualify the data necessary.

Q So, Dr. Olsen, do I understand correctly that what you're telling the court here is that the data is reliable because less than 10 percent of it, I 11:16AM guess perhaps less than 2 percent of it, was rejected by the scientists that were retained by Motley Rice for this case?

A No.

Q Help me understand then what this means, that 11:17AM you had a 98 percent completeness.

A That, you know, approximately less than 2 percent of the data was rejected.

Q Doesn't -- what does that tell us about the quality of the data? 11:17AM

A That's one of the parameters that the EPA uses. The others ones, I've said there, is accurate, precise, representative and comparable, and the last one they use is completeness.

Q Dr. Olsen, isn't it true that if Motley Rice's experts simply chose not to reject data, you would necessarily get a high completeness? 11:17AM

MR. PAGE: I want to make a standing objection to the Record that you kept on talking about the Motley Rice experts. These experts in this case have been retained by the State of Oklahoma, approved by the State of Oklahoma and Attorney General, therefore. They've been compensated by Motley Rice, but they're not Motley Rice's experts. They're the State of Oklahoma's experts in this case. If I could have that standing objection to your questions that constantly refer to the experts as being Motley Rice's experts, I would appreciate it, Mr. George. 11:17AM 11:18AM

MR. GEORGE: I think the Record is clear, but you can have whatever standing objection you like. 11:18AM

Q Do you recall my question, Dr. Olsen?

A No. If you want to state that again --

MR. GEORGE: Lisa, could you read it back?

(Whereupon, the court reporter read back the previous question.)

A Well, as I understand, you are talking about the various designated experts in the case. This completeness review is done by CDM under my direction. We did a variety of things to the data, including rejecting it. None of that data was ever given to the experts because we had already rejected it. There was other qualified data, and they were given to that data, and then it was up to them whether they used that qualified data or not in their analysis. So this was independent from the experts on what data they used. On what data was rejected, they never got that data, and then there was qualified data that was up to them as an expert whether it was usable or not. 11:18AM 11:19AM 11:19AM

Q But just so the Record is clear, all the 98 percent completeness tells us is about 2 percent of the data was rejected by CDM; right?

A That's right. The overall reliability and usability of the data depends upon the accuracy, precision, representativeness and the comparable and then, of course, the independent evaluations of each of the experts, whether, you know, they believe it's good data and fits their analysis and what they want 11:19AM 11:19AM

to do with it, things like that.
Q Well, how -- I didn't mean to cut you off. How much of the 98 percent of the data that CDM had determined was accurate was subsequently rejected by another expert? 11:20AM
A I don't know that. We did not give them any rejected data. It was always screened out of their data requests. There was about in the whole database about 3 -- a little over 3 percent qualified data, and that was up to them whether they 11:20AM used that data or not, and frank -- you know, it was up to those experts whether they used any of the data we gave them or not. That's the basis of what we gave to them was no rejected data and then some of it was qualified and then there was the rest of 11:20AM the data, and whether they decided to use that, whether it was usable for their opinions, that was up to them.
Q So, Dr. Olsen, you referred earlier to this independent evaluation by the other experts. You 11:21AM don't know, do you, as we sit here today, whether they rejected any data that CDM provided as being --
A I don't know --
Q Go ahead.
A Excuse me if I interrupted you. I don't know. 11:21AM

In some cases I had discussions with them about the data. For instance, I had discussion with Gene Welch and Denny Cooke about the dissolved organic carbon data that we collected.

Q Collected from where; the lake? 11:21AM

A There was lakes and inlets and rivers.

Q What was the point that was being discussed on total -- you said dissolved organic carbon?

A Yeah. We typically collect total organic carbon, and they wanted some dissolved organic 11:21AM carbon numbers. After they started looking at those data, they gave me a call, and I looked at those data and I decided that those -- with them, that the dissolved organic carbon data shouldn't be used for any definitive analysis. It had to do with the 11:22AM filtering step that was done and the filter that was used in that case. There was potentially an interference that could have been created with the filter.

So I advised them at that point that, you 11:22AM know, they should not put a lot of weight in that dissolved organic carbon. Periodically there were other parameters like that that various experts called me for advice, you know, once they started looking at the data and had specific questions on it 11:22AM

and then I would look into it further, and in some cases I would, you know, make a recommendation and in some cases I said, you know, that's good data, it's kind of up to you in your evaluation how you use it and how you don't use it. 11:22AM

Q Dr. Olsen, how is it that CDM did not catch the problem with the filtering on this data related to organic carbon prior to sending it out to the experts for use?

A It's a very small dataset and digging into the literature deeper, there's a recommendation for a different type of filter or there's some indications that -- that potentially there's an interference with the type of filter we used. It's not in any -- as I could figure out, not in any standard protocol 11:23AM or recommendation, but there is an indication in the literature that there is a potential -- potential problem, so that's why I said -- I just alerted them to all that information. It was really up to them whether they ended up using it or not, but I made 11:23AM the recommendation because of this potential interference or problem with the filter that that data is questionable.

Q But, Dr. Olsen, you agree that that potentially problematic data made it through CDM's 11:24AM

QA/QC process?
A Again, there wasn't any reason to reject it on the surface. Based on standard protocol or analysis, all the QA/QC was okay. It was their evaluation and questioning it that really alerted us to dig deeper into the literature to see whether there could be a problem with that. 11:24AM
Q So is the answer to my question yes?
A Our QA -- I think you said our QA/QA didn't catch this, and I was just trying to give you the reason why I didn't catch it. I should have stated we did not catch that initially because it wasn't a standard protocol in review that you would typically do in the quality review that we did. 11:24AM
Q Dr. Olsen, where are the error statistics for the sampling methods and lab tests used to generate the data that you refer to in your expert report? 11:24AM
A What do you mean by the error statistics?
Q What do you understand error statistics to be?
A I don't have the faintest idea what you mean. So that's why I'm asking you to explain it. 11:25AM
Q Okay. Dr. Olsen, have you ever computed a rate of error associated with an environmental sampling dataset?
A A rate of error, again, you're going to have 11:25AM

to elaborate on that.
Q You've never computed a rate of error?
MR. PAGE: Object to the form.
A That's such a broad meaning, I don't know what you're referring to. You mean analytical error? 11:25AM
Q Correct. That's one type of error.
A Okay. That narrows it a little bit. I need some more help here.
Q Do you know how to compute the range of error, analytical error? 11:25AM
A Tell me what you are referring to here. Maybe if you tell me how you do it, I'll have a different terminology for it.
Q Well, for example, have you ever heard of a t-test? 11:26AM
A Yeah, uh-huh.
Q What's a t-test?
A T-test is a comparison of two datasets to see if they're comparable. It's a parametric test. You have to have a normal distribution to make those two 11:26AM t-tests, and you do it at a particular confidence level, so you can make it at a 95 percent confidence level one set of data versus another set of data.
Q Okay, and have you had experience in the past performing t-tests on environmental sampling data? 11:26AM

A Yes.
Q Did you perform a t-test analysis on the environmental sampling data described in your report?
A Why would you have done that? I don't understand. We didn't do it because I don't see anywhere where it would have been appropriate to do. 11:26AM
Q Well, is it appropriate in instances where you are comparing datasets?
A Not in this case. 11:26AM
Q Why not?
A This -- that type of statistical testing was not done in this, and that wasn't the purpose of this type of test, to do statistical comparisons of various data to see whether they were comparable or not. 11:27AM
Q For example, the table we looked at earlier that had the -- I think it's Table 6.4-2A.
A Yeah.
Q Do you recall that table? 11:27AM
A Yeah.
Q That's a comparative analysis; correct?
A Yeah, qualitative comparison of data.
Q It's not quantitative?
A Well, the data is quantitative, but no t-tests 11:27AM

or anything were done on that data.
Q Why not?
A That wasn't -- a t-test isn't appropriate in my opinion for the data that we're looking at.
Q Dr. Olsen, do you agree that the dataset, the environmental sampling dataset that you're working off of in this case has a lot of variability in it? 11:27AM
A Yes.
Q Do you acknowledge that there are -- pick a parameter, any parameter in this case, outliers -- 11:28AM
A Yes.
Q -- within the dataset?
A Yeah, there were some, uh-huh.
Q And do you agree that a dataset with a lot of variability and with a few outlier values can skew the ability of a scientist to make meaningful interpretations based on averages or mean values across the dataset? 11:28AM
A That's a long question. Can you break that down and restate it? Maybe we can do it in parts or maybe I can write down the first part and then -- 11:28AM
MR. GEORGE: Let's read it back. I think it is a one-part question but it is long.
(Whereupon, the court reporter read back the previous question.) 11:28AM

A With mean values?
Q Or averages.
A Average -- if that's all you use potentially and if you didn't consider the outliers potentially, that's a pretty general statement of -- you know, it doesn't reflect what we did, but if you did that, if you included the outliers and only looked at averages, which we didn't do, there could be, depending on the particular dataset, there could be -- there could be some -- what did you characterize it as? 11:29AM
Q Some skewing in the ability of a scientist to make meaningful interpretations.
A Skewing, that's an interesting -- that's an interesting terminology, skewing. If you mean biased -- 11:29AM
Q Sure.
A -- or coming up with wrong conclusions, that all, you know, depends on how many outliers there were and the population distribution. You know, so many things, it's hard to answer your question with a yes or no. Sorry. 11:30AM
Q Let's try to simplify it. Do you agree that a dataset with a lot of variability and a number of outliers can affect the ability of a scientist to 11:30AM

make meaningful interpretations of that data based on averages?

A Based on averages alone, potentially.

Q Okay, and, Dr. Olsen, I think you said you, and I assume you meant CDM as well, didn't perform analysis based on averages; right? 11:30AM

A Not averages alone.

Q Okay. Are you aware that there are other experts retained by Motley Rice working in this case off of the dataset that you provided? 11:30AM

A Yes.

Q Okay. Are they in any instance using averages to draw conclusions?

A I'd have to go back and look at their data, and it may be appropriate to use averages depending on the dataset. 11:31AM

Q Dr. Olsen, did you compute a range of variability in the dataset?

A A range of variability? Those general statistics are in the PCA reflected by, you know, standard deviations for various parameters for various sets of data. So those statistics are there and reported in the summary, not in our summary tables, but in the databases. What I did report on some of the figures are lower and upper quartiles 11:31AM 11:32AM

and median values. So in that case, I was looking at the range of data.

Q So you did evaluate the variability in the dataset?

A Yes. 11:32AM

Q Okay. Dr. Olsen, did you exclude any data from your analysis based upon the conclusion that the variability around that data or parameter was too extreme for the data to be useful?

A We looked at the variability but typically, 11:32AM according to our rules that we had already come up with that are outlined in here about percentage completeness, things like that, it excluded those that may be affected by that. So we didn't have to look at that specifically to exclude pieces of data. 11:33AM

Q Okay.

A We did exclude some outliers, outlier samples in the analysis, and those are outlaid in the report.

Q Okay. Out of the thousands of samples in this 11:33AM case, how many samples did you exclude from your analysis because they were considered to be outliers that are not representative of the conditions being studied?

A We excluded a lot of specific parameters. For 11:33AM

instance, I reported -- for instance, there's some sulfate values from the lake we had to exclude. They definitely showed up on our -- one of the ways you look for outliers is look at the probability plots, and I discuss those in here, and I actually -- in one of the appendices we have the probability plots run SW3, which has like 573 samples in it of all the parameters. So you look at those probability plots, and if you see a couple of data that are way out there, you start looking at those, and so I remember, for instance, sulfate on the lakes, and I referred to those, that we excluded those two samples, those two analyses from that, from that particular sample. 11:33AM 11:34AM

So there was a lot of cases where we excluded specific data, and a lot of times because we excluded data, that left holes in the analysis, PCA analysis, and that sample could not be used, and that's all outlined. So in that case, because we excluded data, it didn't have enough data to complete a complete analysis of it in the principal component analysis. Those samples were excluded. Other cases we excluded them right up front and those are listed in the report. 11:34AM 11:34AM

Q Well -- 11:35AM

A So, you know, we can go that that section, and I can tell you right away how many we excluded up front because they were extreme outliers overall. I'd have to look up how many were excluded because they were missing individual data pieces. 11:35AM

Q All right. Let's divide our discussion for a moment.

A Sure.

Q The example that you've given me is a part of the data associated with a sample, a particular 11:35AM parameter being excluded or rejected; correct?

A Yes.

Q But in those instances, you concluded that the balance of the data associated with that sample was reliable; is that right? 11:35AM

A That's correct, but what I was trying to say, if there was enough of those for any individual sample, that sample would be rejected.

Q But only rejected for purposes of the PCA; correct? 11:35AM

A Yes.

Q Okay. Let's set aside PCA. We're going to spend some time on PCA. How is it possible that a sample with respect to a reported value for one parameter in that sample can be an outlier but the 11:36AM

overall sample is not an outlier?
A Well, in this case, all individual samples -- analysis are done individually. So in our opinion, the lab just screwed up on the sulfate analysis. It was obvious. 11:36AM
Q It was a lab error --
A Yeah.
Q -- as opposed to a problem with the sample collection; is that your opinion?
A Oh, yes, definitely. 11:36AM
Q All right. Let's talk about whole samples and all data associated with a given sample. Okay. You got that reference?
A Uh-huh.
Q How many samples did you exclude from your analysis because they were considered to be outliers? 11:36AM
MR. PAGE: Object to the form. I just want to make this clear. I think it would help us move along. When you say your analysis, sometimes I think Dr. Olsen is thinking about the PCA, and is this line of questions focused on all experts' analysis or all expert qualified data? 11:36AM
MR. GEORGE: His analysis, whatever he considers that to be. 11:37AM

MR. PAGE: Oh, his personal analysis.
Okay. Thank you, Mr. George.
A Again, that's why maybe I elaborated too much there. There's two ways we exclude samples, and the first one is because there's individual components of that sample that make it no good, but there were some samples that we rejected outright up front, and those are listed in Section 6 if you want to go there. 11:37AM
Q Let's look there because I'm not recalling what you are talking about. Section 6? 11:37AM
A I'll find it here in a minute. The following samples were removed as outliers in selecting corresponding PCA runs. That's in the middle of 6-41. 11:38AM
Q Okay. So, for example, this first one edge of field spread 073 --
A Correct.
Q -- was that entire sample rejected as an outlier based upon your review? 11:38AM
A Yes.
Q Okay. So you concluded that was unreliable based on whatever information you had available to you?
A I didn't say it was unreliable. It was a 11:38AM

definite outlier.
Q Okay. You didn't consider it to be appropriate to be used in your analysis?
A That's right.
Q Now, when you say it was removed as an outlier and then you refer at the end to PCA runs -- 11:38AM
A Yes.
Q -- did you remove edge of field spread 73B from just your PCA runs or from all of your analysis in your expert report? 11:39AM
A From the PCA runs.
Q Well, why would it be appropriate -- I'm sorry. Why would it be inappropriate to use that data associated with that sample in the PCA but appropriate to use it in other analysis? 11:39AM
A In our opinion here it would have skewed the PCA analysis and that's why we dropped it.
Q Could it not skew other analysis?
A I'd have to go back and look at that and see if we dropped it or not, like in the averages or something. 11:39AM
Q Okay. You're just not sure whether you dropped it today?
A No, I'm not.
Q Well, let's look at the table that we've been 11:39AM

talking about some, Table 6.4-2A.
A Right.
Q Is that sample in this analysis?
A I'd have to go back and look to see whether it is or not. 11:40AM
Q Okay. You don't know whether you dropped it from that analysis or not?
A No.
Q The paragraph underneath that says -- strike that. There's some other samples listed here, Lake 11:40AM
Sample 1:5 and 2:5. Those are the sulfate?
A Right. Looks like we dropped those whole entire samples out.
Q What was the problem with the -- on the next page -- the cow manure leachate samples? 11:40AM
A Those were done at a different ratio than the standard 20-to-1 ratio. There's only a few of those done and, again, because they were done at a smaller liquid-to-solid ratio, the concentrations were even much more extremely high than the 20-to-1s, which 11:41AM
again created some very high concentrations that we deemed outlier and that were really representative or that the 20-to-1 was more representative of leachate than the 4-to-1.
Q Dr. Olsen, it appears on all the samples 11:41AM

listed on Page 6-42 that the reason they were excluded was due to extremely high concentrations for a particular variable; is that right?

A Well, they were excluded because most of the variables were extremely, extremely high. So, you know, it was reflected in the overall composition. 11:41AM

Q So is it your opinion, Dr. Olsen, that those samples are not representative of field conditions?

A I didn't say that they couldn't be representative field conditions. It's that I concluded the 20-to-1 were more usable in our dataset and would more represent typical dilutions that you would find on a runoff field. 11:42AM

Q Dr. Olsen, what is the statistical test that you used to identify a sample as an outlier because of a, quote, extremely high concentration? 11:42AM

A There was no statistical test. It was based on probability plots, that typically these plotted off the lines or way far from the lines of the rest of the data. So they were graphically evaluated in terms of whether they were outliers or not in most cases. 11:42AM

Q How far off the line would they have to plot for it to be excluded?

A They were usually dots that were separate from 11:42AM

the main line of the body. There's no determination of exactly, you know, how far or what concentrations. These were definitely, you know, extreme, much, much higher concentrations. For instance, the sulfate concentrations, those are in 11:43AM some cases, you know, two to three orders of magnitude, not three orders but, you know, two orders of magnitude above any other sulfate concentrations we've seen. So, you know, these are all good outliers. We didn't do, you know, a 11:43AM particularly Lilford's test or any particular test like that to determine whether these are outliers because there wasn't really -- you know, if you only have four samples, that isn't -- you can't do that type of statistical test. This was more qualitative 11:43AM graphical interpretation of outliers.

Q But, Dr. Olsen, you could have done that test across the entire dataset to identify outliers, could you not?

A I don't know if that type of test would have 11:43AM been appropriate or not.

Q Why would it not be appropriate?

A Well, I'm trying to -- I mean, we could have always included that type of analysis in here but, again, I think the graphical way to do this is -- in 11:44AM

my opinion it is entirely appropriate; the way we did it was entirely appropriate.

Q But the determinations on outliers were made based upon your subjective judgment looking at a graph; is that correct? 11:44AM

MR. PAGE: Object to the form.

A I don't think these were very subjective.

Q Well, what's the criteria then, Dr. Olsen?

A It was far away from the rest of the dataset.

Q But you can't quantify far? 11:44AM

A Well, I did for the sulfate for you, to at least two orders of magnitude different. I'd have to go back and look at those to see how far they were from the other ones but, again, they were, you know, a lot higher concentrations than the 20-to-1 11:44AM and we had a lot more 20-to-1s in it skewed and in my opinion the interpretations of the rest of the dataset, so we left them out.

Q Is it true, Dr. Olsen, that CDM did not have a standardized statistical measure for identifying and 11:45AM excluding outliers from its dataset?

A That's right. We did not do a statistical evaluation of outliers.

Q All right. Dr. Olsen, let's talk about dissolved constituents versus total constituents. 11:45AM

Are you familiar with that subject?
A Yes, sir.
Q Do you agree that a high frequency of reported dissolved concentrations for a particular constituent greater than the total concentration of 11:45AM
that same constituent in the same samples can signal problems with analytical methods and the reliability of the data generated from those methods?
A Not necessarily.
Q Can it ever signal a problem? 11:46AM
A Well, in some cases. We always look at that.
Q Okay. Dr. Olsen, is it indeed true that you physically cannot have more of a dissolved constituent in a sample than you have of the total measure of that constituent? 11:46AM
A Theoretically, but let's consider the example that, say, the dissolved was equal to the total.
Q That wasn't my question.
A I'm trying to explain the answer.
Q Are you going to answer my question as part of 11:46AM the explanation?
A Give me the question again.
MR. GEORGE: Can you read it back, Lisa?
(Whereupon, the court reporter read back the previous question at Page 114, Lines

12-15.)
A Could you also read my answer?
(Whereupon, the court reporter read back the previous answer at Page 114, Lines 15-17.)
A I meant to say theoretically you couldn't. I thought I said that first but, I'm sorry, I didn't put that in there. I said it in my mind, but I tried to answer your question first. Theoretically you couldn't, but if I could give an illustration where you have the total equal dissolved, and analytically you have a 50-50 chance that the total is going to be less than dissolved or the dissolved is going to be less than the total. That's just the nature of the analysis, you know, if they're equal. So you can have a 50-50 probability right there, that you're going to get 50 percent that are the other way, and there's nothing wrong with the dataset at all. 11:47AM
Q Well, but you had instances in the environmental sampling data that CDM collected in this case that the dissolved being greater than, not equal to, the total concentration of a particular parameter; correct? 11:48AM
A Yeah, but I'm saying theoretically the dissolved portion in most cases was almost equal to 11:48AM

the total and if it was, you know, you would have automatically have 50-50 percent.

Q Well, let's get out of the theoretical for the moment and let's get into the actual data. Could you turn to Page 3-18. Can you read the second -- 11:48AM

in the second paragraph under Section 3-10 the first full sentence?

A The dissolved fraction was greater than the total fraction for common cadions, sodium 55.9 percent, potassium 34 percent and magnesium 38 11:49AM percent and calcium 42.2 percent, and these are all cases, particularly sodium and potassium, that almost all the dissolved -- all the total was equal to the dissolved. I mean, most of the fraction was dissolved. So this would be a case where you would 11:49AM expect higher numbers.

Q You would expect the higher number of dissolved than total?

A If they're equal concentrations, you would expect 50-50. 11:49AM

Q Well, but these weren't equal concentrations, were they?

A Well, I'm saying they were almost equal because sodium is almost always in the soluble fraction. 11:49AM

Q All right. Let me make sure I understand this first sentence. With respect to sodium, you give a percentage of 55.9 percent?
A Right.
Q What does that mean? 11:50AM
A That the total was -- let me see, dissolved fraction was greater than the total of 55.9 percent.
Q Okay. So out of all the samples where you measured both total and dissolved sodium, in 55.9 percent of the time the reported dissolved 11:50AM concentration was greater than the total concentration; is that right?
A That's right, but if they were equal, you would have expected that number to be 50 percent, and I'm saying that sodium in most cases would 11:50AM almost equal the total.
Q But they weren't equal, were they?
A No, but they were almost equal, so you would expect a number pretty similar to that number.
Q Okay, and sodium is not the only instance 11:50AM where you had parameters that with some frequency reported dissolved concentrations greater than total concentrations in the same sample; right?
A That's right.
Q Okay. If you look at Table 3.10-1, if you 11:50AM

could find that in your report. Do you have the table in front of you, Dr. Olsen?

A What's that?

Q Table 3.10-1.

A Yes. 11:51AM

Q What is that table?

A It shows all the pairs of percent of where dissolved was greater than totals.

Q Okay.

A And we did a more thorough analysis in the 11:51AM next table of some of the key parameters, like copper and zinc, showing that these numbers were a lot, lot less, and the frequency of dissolved greater than total was much, much less when --

Q When what? 11:52AM

A When you exclude some of the analyses that were near the detection limits where you get a more frequency of dissolved and totals because the accuracy isn't there. So those numbers go down tremendously if you just look at the higher detect 11:52AM levels.

Q All right. So you're comparing Table 3.10-1 to Table 3.10-2?

A Yes.

Q And the difference between the percentages on 11:52AM

those tables is that for some of the parameters in this analysis, you have eliminated samples that were close to the detection limit; is that right?

A Or a -- we didn't eliminate them from analysis or evaluations. We just did another analysis that didn't consider those because they were so near the detection limit. 11:52AM

Q Okay, but, Dr. Olsen, for purposes of your analysis in your report, your opinions?

A Uh-huh. 11:53AM

Q And the PCA analysis that you've done, did you eliminate samples that were reported close to the detection limit?

A No.

Q Okay. So let's go back to Table 3.10-1. You used dissolved copper and zinc in your PCA analysis, did you not? 11:53AM

A No.

Q Did you use copper and zinc in your PCA analysis? 11:53AM

A The ones I evaluated more thoroughly were total copper and total zinc, and those are the ones that I wrote about most. There were sensitivity runs as I described in there where we compared adding the dissolved, and in my opinion it didn't 11:53AM

change the conclusions, and that's why we did the sensitivity analysis. So in the final evaluations, my opinions are based only upon the total concentrations.

Q All right. Let me rephrase my question. Dr. Olsen, you used the total copper and total zinc parameters in your PCA analysis; correct? 11:53AM

A That's right.

Q Did you use sodium in your PCA?

A Yes. 11:54AM

Q What is the percent reported for those three constituents where in the sampling data the dissolved amount of the constituent exceeded the total? Let's do zinc first.

A On Table 3.10-1 which considers the whole dataset, it's 36.7 percent. 11:54AM

Q That's copper?

A And the next table it goes down to, you know, 4 percent and 7 percent if you get away -- if you don't consider some of the low detect values. 11:54AM

Q If you don't consider some of the values that you actually used in your PCA; is that right?

A I stated it clearly that none of these were used in the PCA. None of the dissolveds were used in the PCA, just the totals. 11:54AM

Q Well, but the --
A Except for the sensitivity ones.
Q The sample itself and the reported value for total was used; correct?
A Yes. 11:55AM
Q Okay. What about with respect to zinc; what are the number of instances in which the reported dissolved fraction exceeded the reported total value for zinc?
A 27.8. Again, that number is a lot less if you consider -- don't consider some of the ones near the detection limit. 11:55AM
Q All right. What about sodium, Dr. Olsen?
A Sodium is 55.9 percent and, again, we've already discussed, because sodium is mostly always dissolved, dissolves and total are almost always equal, and if they're equal, you have a number that was 50 percent automatically. 11:55AM
Q That's an issue unique to sodium?
A No. There's a whole bunch of these, sodium, potassium, magnesium, all, you know, of the ones that are mostly dissolved in solution. 11:55AM
Q Is that true with respect to copper and zinc?
A Well, that's a good question. I haven't gone back and looked at copper, how much of that is 11:56AM

dissolved. I know Daniels wrote a paper about how the organic content of poultry litter keeps the copper dissolved and that's why you see so much in the runoff. So a substantial portion of the copper, because it's complex with the organic carbon, is actually in a dissolved form in the environment, but I haven't specifically compared totals to dissolved concentrations for copper. 11:56AM

Q Turn back to Page 3-188 of your report, Dr. Olsen. In this same subject, the paragraph beneath the one that we read from a moment ago, you talk about an analysis that you completed, and you refer to this Table 3.10-2 that you describe as the relative percent difference; do you see that? 11:56AM

A Which paragraph are you in? 11:57AM

Q The second from the bottom.

A Okay, okay. Where do you see relative percent difference?

Q The last sentence of that paragraph.

A Okay. This table also represents the sample counts and percent -- RPD between the two samples is greater than 20 and 35 percent, okay. 11:57AM

Q What do you mean by relative percent difference?

A Relative percent difference is -- it's defined 11:57AM

in this section here, but it's essentially the two concentrations subtracted from each other, divided by the sum, divided by two of the sum. So it's the difference divided by the average of the two samples times 100 percent and the absolute value of that. 11:58AM

Q On the very next page, Dr. Olsen, in the first full paragraph, you are referring to the same Table 3.2-10. About halfway down you say, these sample pairs are not considered true laboratory duplicates and the relative percent difference of greater than 11:58AM 20 percent would be more appropriate.

A Yes.

Q Do you see that?

A Yes.

Q And then directly above it in the sentence 11:58AM that begins with and RPD; do you see that?

A Yes.

Q You say and relative percent difference of 20 percent for water is the typical analytical precision limit for true laboratory duplicates; do 11:58AM you see that?

A Yes.

Q What does that mean? I don't understand that. What is relative percent difference and how does it apply to duplicates? Help me understand it. 11:59AM

A First of all, we need to describe what a duplicate is, and that has a lot of different meanings depending on, you know, how you exactly collect it. So I like it whenever you referred to a duplicate, you know, describe what's being done, and here we're talking about laboratory duplicates, and so when they receive a sample, it's in one container and they split it from that container, and so -- and it undergoes the same procedure. The same person analyzes. Everything is exactly the same in the laboratory, and that's -- so it's under a very well controlled situation, and that's a laboratory duplicate, and typically they like to see the two numbers agree within plus or minus 20 percent, just recognizing that that's the inherent analytical precision in a laboratory where the analyst does it, that it's the same sample that's split.

Now, like in the field when Conestoga-Rovers selected their samples, those aren't true duplicates. You know, they collected another sample after we did. So it's not like a laboratory duplicate. So you would expect a much higher percentage of precision here than the plus or minus 20, and so when we were comparing these samples, again, they weren't laboratory duplicates, they were

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field duplicates, and so I'm saying, you know, because of that, there's more less precision than they did in the lab that has that plus or minus 20.

Q All right. Let me back up and see because I can understand the lab. That makes some sense to me what happens in the lab. 12:01PM

A Yeah, yeah.

Q Is it true, Dr. Olsen, in a typical lab setting where you're evaluating an environmental sample and you've got a true lab duplicate, that sort of a rule of thumb for testing the precision of the analytical method is no more than 20 percent relative percent difference? 12:01PM

A That's right.

Q Okay. All right. Now, why would you apply relative percent difference, which is a concept that you've described as related to duplicates, to the dissolved versus total concentrations of a constituent in the same sample? 12:01PM

A Again, just to try to get a feel for how different those analysis were and, you know, back to that hypothesis or I shouldn't say hypothesis but that fact that if they aren't different, you'd automatically expect a 50 percent dissolved versus total switchover, you know. If they're actually the 12:01PM 12:02PM

same number, that is, the relative percent difference is zero, you're automatically going to have a 50 percent chance for -- the numbers are going to be 50 percent that dissolved is less than -- is greater than total and so, you know, if we have higher relative percent differences, then that chance is less than 50 percent. 12:02PM

Q Okay. CDM actually collected what it refers to as duplicates in terms of samples in this case; correct? 12:02PM

MR. PAGE: Object to the form.

A You mean field duplicates?

Q Well, however you use the term. Let's turn to Table 3.11.2 -- dash 2. Do you have that table in front of you? 12:03PM

A Yeah. 3.11.2-1?

Q Dash 2.

A Oh, you want 2?

Q Yes, sir.

A Okay. Gotcha. 12:03PM

Q And that table is entitled Average RPD For Selected Parameters in Water; correct?

A Yes.

Q And you see the far right-hand column is entitled the Number of Duplicate Pairs? 12:03PM

A Right.
Q So let me ask my question again. CDM collected duplicate pairs of samples as part of its investigation in this case; correct?
A That's correct. 12:04PM
Q Okay. Now, how many of the -- well, let me back up. You computed relative percent difference between those duplicate pairs; correct?
A That's right.
Q For each parameter; right? 12:04PM
A Yes.
Q How many duplicate samples were collected? I can't tell from looking at this.
A Well, it probably states in the text, but the maximum number reported on here is 26. 12:04PM
Q I actually, to be fair, Dr. Olsen, see a number higher than that --
A Oh, you do?
Q -- which is 64 beside total dissolved phosphorus. 12:04PM
A Maybe we're not looking at the same table here. I didn't look at the table total. I was just looking at the first page. I'm sorry. It depended on the parameter, yeah, because I mean, some -- a lot of parameter -- a lot of samples were only 12:04PM

collected for phosphorus, so there are more duplicates, yeah. So it depends on parameter and you're right. For phosphorus, it looks like there was 64.

Q So the maximum number of duplicates that the State collected as part of its investigation in this case is 64; is that right? 12:05PM

A Well, I should check the text. It's probably described on -- you can't compute an RPD if there were some non-detect samples, which there were, so there may have been more and we just couldn't compute that, and that's what it says at the bottom of the table, NC, not calculated, because one or both of the result are below detection. So there may have been 60 -- around that number but, you know, there may have been some that we could have used, but it's around that number for phosphorus. 12:05PM

Q How did you decide how many duplicate pairs of samples to collect as part of this investigation?

A Typically you want to collect, you know, one out of twenty or so. There probably wasn't that many collected. You know, that's kind of a rule of thumb, but you want to collect enough to evaluate your sampling precision and your analytical precision. 12:05PM 12:06PM

Q Do you know how many total samples were collected in this case, not just duplicates but totals?
A I don't remember right offhand, yeah.
Q Dr. Olsen, did you get anywhere near to the 1-in-20 ratio in terms of the number of duplicates? 12:06PM
A That's what I'm saying. I think this number is look based on that rule of thumb.
Q All right. Somewhere in your report you would report the number of samples and total taken; right? 12:06PM
A Yeah, somewhere in there.
Q I may look for it over the lunch hour. Dr. Olsen, can you go through the water samples on Table 3.11.2-2 and identify verbally on the Record the parameters where the relative percent difference in 12:06PM the duplicates exceeds 20.
A Again, for field duplicate that's not a criteria that we would use. That's for laboratory duplicates. So I can do that. I just want to say that that's not an appropriate criteria in my 12:07PM opinion for field samples, but we can go ahead and do it if you want to do it.
Q You've made your statement. Can you answer my question? Just call them off over 20?
A Vanadium is at 28. Zinc is at 24. These are 12:07PM

dissolved. Aluminum at 50. Total arsenic of 21. Total chromium at 50. Total cobalt at 82. Total coliform at 89. Again, that plus or minus is -- 20 is for chemical parameters in a laboratory and it's not for biological parameters. So this would be a bacteria that doesn't have that type of criteria. Total copper is 34. Total iron is 53. Total lead is 64. Total manganese is 33. Total molybdenum is 46. Total nickel is 26. Total zinc is 38. Dissolved orthophosphorus by 365.2 is 28. That wasn't our preferred method. Next one is one of our preferred methods for phosphorus. Soluble reactive phosphorus is not over 20. Sorry. You asked me not to do that. Total dissolved P by 362.2, again not one of the preferred phosphorus analysis method, is 31. Rest of the Ps are below 20, except the total P by 60-20 is right at 21. Ammonium nitrate is 22. Skipping through a bunch of these, parameters that are below 20, TKN is 45, TSS is 50, again some biological parameters that are high. Coliform at 40, E. coli 63, Enterococci at 67, fecal coliform at 69, Salmonella at 73, Staphylococcus at 41. Again, that plus or minus 20 doesn't apply to those, and 17 beta-estradiol right at 24 percent.

12:07PM 12:08PM 12:08PM 12:09PM 12:09PM

Q Dr. Olsen, how many of those parameters that

you've just read off which exceed a relative percent difference between original sample and duplicate of 20 percent were used in your PCA?

A Total arsenic, coliform, total copper, total iron, total manganese, total nickle, total zinc, TKN, TSS and then the bacteria, coliform, E. coli, Enterococci, fecal coliform, Staphylococcus and, again, I want to put on the Record and make very sure that plus or minus 20 percent doesn't really apply to bacteria, and that plus or minus is not an appropriate evaluation criteria for field duplicates. 12:10PM 12:10PM

Q All right. Dr. Olsen, if I kept track, and hopefully you'll trust me on this, I heard 14 of your 26 parameters that you used in your PCA had duplicates versus original with a relative percent difference greater than 20 percent; is that right? 12:11PM

MR. PAGE: Object to the form.

Q Does that sound right?

A Again, given the assumption that that's the right criteria to use, 20 percent, which I've already said it isn't. 12:11PM

Q Let's talk for a moment about the bacteria. Every one of your bacteria analysis of duplicates had a relative percent difference greater than 41 12:11PM

percent; correct?
A Yes.
Q Okay. So what that means, if I understand this correctly, Dr. Olsen, is that when you -- when the lab analyzes a sample that was taken at the same time from the same location for bacteria, you've got an original and a duplicate, and they analyze and count the number of bacteria, they're going to get a difference in those two reported values of at least 41 percent; is that right? 12:11PM 12:12PM
A Well, that's an average, so there's a range of those, and that's for only three samples that looks like it was done for, so --
Q I mean, they could get up to a 69 percent difference in fecal coliform; correct? 12:12PM
A Yeah, based on this determination, that's the numbers that we got for those, for bacteria.
Q So what does that amount of difference between original and duplicate pairs tell you about the precision and reliability of that data? 12:12PM
A Just tells me that biology and bacteria are variable in the environment when you collect two samples, and we knew that going in. I mean, that's what Dr. Harwood originally said. It's -- you know, the variability in bacteria is -- there's a lot of 12:13PM

variability in the environment, so --
Q Given that variability, Dr. Olsen, how did you determine that the values that you used for bacteria in your analysis were representative?
A I believe they're representative because the samples that we collected were representative of the environment, and this is the typical variability that you're going to get. 12:13PM
Q Did you perform any statistical tests or formal evaluations to confirm your belief that the bacteria counts reported in the dataset were representative? 12:13PM
A We didn't do any, as I say, statistics tests on comparability.
Q Dr. Olsen, you've said a time or two that you don't believe the 20 percent, relative percent difference is the proper criteria to evaluate the duplicates shown on Table 3.2 -- I'm sorry, 3.11.2-2; correct? 12:13PM
A That's right. 12:14PM
Q What is the relative criteria; how much relative percent difference is too much?
A Typically for field analysis, I think the number is plus or minus, you know, 35 percent or so, so you need to look in that range but, again, 12:14PM

depending on the particular parameter, there may be reasons why it's more variable.

Q So your total zinc exceeds that standard; correct?

A Total zinc is just over that number a little bit. So 38 percent versus 35, you know, that's pretty close. 12:14PM

Q Did you exclude the zinc data from your analysis?

A No. 12:14PM

Q Why not?

A Not the total zinc. Well, again, that was close enough to the plus or minus 35 percent in my opinion.

Q That's close enough? 12:15PM

A Yes. It's still usable data.

Q I'm sorry, how do you measure close enough?

A Well, it's only 38 versus 35 and, you know, looking over all this whole dataset, we did not exclude any data based on RPDs. We did some qualifications of it, which alerts everyone that, you know, some of this data you should use with caution, but overall it doesn't affect my opinion of usability about it. 12:15PM

Q Dr. Olsen, when you earlier said 35 percent is 12:15PM

an appropriate standard, what was your basis for that statement?

MR. PAGE: Object to the form.

A I said that in the literature, there's some suggestion that 35 percent is a better number for your RPD values from the field and, again, there's no hard and fast rules for that and the only hard and fast rule that we know of is the plus or minus 20 percent for actual laboratory data where it's well controlled. 12:15PM 12:16PM

Q Can you identify the literature that you are referring to?

A I'd have to go back and look for that.

Q You didn't exclude any samples from your analysis, including your PCA analysis, due to high reported relative percent differences, did you? 12:16PM

A No. Some of these would be qualified but we didn't exclude any data.

Q Qualified where?

A In the database. 12:16PM

Q Okay. Was the zinc qualified because of the relative percent difference in the database?

A I doubt it. I'd have to go back and look at that and it would be qualified for just particular samples that had the high RPDs. 12:16PM

MR. GEORGE: Let's take a lunch break here.

VIDEOGRAPHER: We are now off the Record. The time is now 12:17 p.m.

(Following a lunch recess at 12:17 p.m., proceedings continued on the Record at 1:23 p.m.)

VIDEOGRAPHER: We are back on the Record. The time is 1:24 p.m.

Q Dr. Olsen, we've talked a time or two about the two edge of field samples collected from Mr. Fite's property where he grazes cattle; do you recall that? 01:23PM

A Yes.

Q Let me hand you what we've marked as Exhibit 2 to your deposition. Do you recognize Exhibit 2? 01:23PM

A Yes.

Q What is it?

A It's a sheet from a field notebook of sampling that occurred March 31st of this year.

Q And you've seen other field notebooks in connection with sampling efforts in this case; correct? 01:24PM

A Yes.

Q The initial at the bottom is -- is it RC?

A Yes. 01:24PM

Q Who is RC?
A That's Rocheda, Bert's employee, Lithochimeia employee.
Q And the date of this particular field notebook is what? 01:24PM
A I already said 3-31-08.
Q I'm sorry if I missed that. Do you see the reference to Mr. Fite on the left-hand side of the page?
A Yes. 01:24PM
Q And could you read the two sentences there that begin with Mr. Fite and continue on to the next?
A Mr. Fife (sic) is running rodeo stock on field to be sampled first. This field has never been 01:25PM applied with poultry waste.
Q And then you see over on the right-hand side the reference to EOFCP1B and 1A?
A Yes.
Q Those are the edge of field samples? 01:25PM
A Well, they were labeled edge of field. They really weren't edge of field samples as I've already described.
Q I thought you told me earlier that you conceded that at least one of them was an edge of 01:25PM

field sample?
A No.
Q Did I mishear that?
A No -- yeah, I never did say that.
Q You haven't looked at the photographs? 01:25PM
A No, I haven't yet, but I know where they were. They weren't on -- well, I guess you could interpret what I said. One was near the road. So I guess you could say that was edge of field, but it wasn't a runoff sample. That sample was a ponded sample, and 01:25PM that's what I was referring to. It was a pond sample, and it wasn't typically a runoff from an edge of field as our other samples were that we labeled edge of field.
Q Was it raining at the time these samples were 01:26PM collected?
A It had rained before. I don't think it was raining at this time.
Q And you weren't present when these samples were collected; right? 01:26PM
A No.
Q And you see where on the field notebook there is a representation that this field has never been applied with poultry waste?
MR. PAGE: Object to the form. 01:26PM

A You want me to read that sentence again? I already read it.
Q Well, do you have any reason to doubt the accuracy of that statement?
A No. Mr. Fife (sic) said it. 01:26PM
Q Well, do you believe him or not?
A Well, that's what he said.
Q Well, do you believe him or not?
A Yes. It doesn't mean poultry waste has never gotten on to the field through either groundwater, 01:26PM springs, dust, application by nearby fields and et cetera, as I discussed this morning.
Q You've investigated that?
A As I already said, we looked at the spring data and, again, this one sample was near where they 01:27PM transport.
Q I'm sorry. Near where what transports?
A Near the road where cattle -- excuse me, where poultry waste is transported, and there's other fields in the area. 01:27PM
Q Are you taking the position, Dr. Olsen, that the samples collected from Mr. Fite's property where cattle were grazing actually reflect poultry litter that blew off of a truck that was driving down the road? 01:27PM

A No, I didn't say that. I'm saying there's a possibility that these are not reflective, which I already talked about this morning, not reflective of cattle leachate and cattle runoff exclusively, and they may not be reflective of cattle at all because of the way that cattle is deposited on a field and the way these samples were collected and that there's other possible ways these could have been contaminated. 01:28PM

Q Are those samples representative of a field where cattle was grazed? 01:28PM

A We're not talking about representative of a field. We're talking about representative of leachate from a field, and I'm saying they may not be representative of leachate from a field. 01:28PM

Q What's the difference between leachate and runoff?

A Again, at least one of these was not a runoff sample. It is just ponded on the field. The other one was actually flowing, but whether that actually flowed over any cattle manure, you know, it's pretty hard to tell at this point and whether that cattle manure even leached. 01:28PM

Q Do you think water flowed over it and it didn't leach? 01:29PM

A I'm saying, yeah, because a lot of the dried cattle patties don't leach a lot.

Q Dr. Olsen, what has occurred since you authored your report in May of this year and today to cause you to doubt the representativeness of the cattle edge of field samples? 01:29PM

A Well, I always did. You know, I've been thinking about it a lot more since then just because those two samples don't look like the other cattle leachate we have, the leachates and the springs, and I already testified to that. So I always wondered about, you know, what's different about these samples, so -- 01:29PM

Q You discussed these samples in your report at length, do you not? 01:29PM

A Yeah, and I say they aren't -- and I make the point in the report that, you know, that they aren't similar to the other ones we have. I said that and I said that, you know, as far as the principal components, cattle plots all over the place if you look at these four samples. Now, if -- 01:30PM

Q Show me --

A Go ahead.

Q Are you through? I didn't mean to cut you off. 01:30PM

A Now, if you actually get down and look at the concentrations, you know, there's a lot of concentrations in these two samples that individually-wise are different than both other cattle leachate and poultry. 01:30PM

MR. PAGE: Is something funny, Mr. George?

MR. GEORGE: I'm sorry?

MR. PAGE: Is something funny?

MR. GEORGE: My head is turned digging in a box. I'm not sure what you're talking about.

MR. PAGE: Just a minute ago you were kind of laughing. I mean, is there something funny going on in this deposition that you want to share with us?

MR. GEORGE: I don't think I have to share anything with you. 01:30PM

MR. GRAVES: Is that an objection, Mr. Page?

MR. PAGE: Yeah, it is.

MR. GRAVES: What's the objection? Just state your objection. 01:30PM

MR. PAGE: I wish you wouldn't laugh and make faces while the witness is answering questions. That's my objection.

MR. GEORGE: I'm not going to comment on 01:31PM

that, Mr. Page.

Q Dr. Olsen, let me hand you what is marked as Exhibit 3 to your deposition. Can you identify Exhibit 3 for the Record? It's a collection of lab reports, but could you provide a general description, please? 01:31PM

A They're lab reports from a laboratory called Environmental Microbiology Laboratory, Incorporated, typically referred to as EML, and EML is doing bacterial analysis of samples collected from the watershed. 01:32PM

Q EML is the principal lab that CDM used for its bacterial work on surface water samples; is that right?

A That's correct. 01:32PM

Q Okay. To the extent there is bacterial data that's used in your analysis, does it generally come from EML?

A Yes.

Q Okay. Could you turn -- I need some help in interpreting some of these things. Could you turn to the page that at the bottom is number ending in 3, 0003, and at the top you see your name. You're listed as the client; correct? 01:32PM

A Yes, uh-huh. 01:33PM

Q Okay. Just to the right of that, there is a series of dates. Do you see those?
A Yes.
Q And on this particular one, for example, it says date of sampling 4-20-2006; do you see that? 01:33PM
A I have the three on mine. So you're not looking at the last three; you're looking at the second to the last three?
Q No.
A There's lot of threes here. You want 33? 01:33PM
Q Yes, sir. I'm sorry, I didn't realize there was two sets of three. Thank you.
A I was at the second set. Okay.
Q Just so we're clear, let's identify this page. At the bottom it's Bates number Olsen 0000773.0003; 01:33PM correct?
A That's correct. I'm on the right page now.
Q Thank you. The date of sampling on this particular report is listed as 4-2 0-2006; do you see that? 01:33PM
A Yes.
Q What does that reflect; what does that mean, date of sampling?
A Well, these were data collected by USGS, and typically we don't do their analysis. They do a 01:34PM

cooperative program with the State, but their labs were not set up to do the breadth of analysis of all the different types of bacteria that we wanted, so we had a cooperative agreement with them, and they would send splits of their samples to a laboratory. 01:34PM
So they sampled it on 4-20-2006.
Q And when you say sampled, Dr. Olsen, you mean that's the data which this particular water sample was collected from river or whatever it was collected from; right? 01:34PM
A Yeah, and if you go over to the chain of custody, you can see that Monica Allen did that sampling for the USGS on 4-20-06 and, you know, she actually has the time there of at 12 -- I can't read her writing for sure. Looks like 1230 and it was 01:35PM shipped at 1600 that day.
Q Okay.
A But the sampling was done on 4-20, and that's what that reflects.
Q Thank you. Dr. Olsen, the next heading are 01:35PM labeled as date of receipt and it shows the following date, 4-21-2006; do you see that?
A Yes.
Q And that was the date this sample was received by whom? 01:35PM

A That's the laboratory. Again, you can see that on the next page. Ann Morrissey at EML received the sample the next morning at 9:30 a.m. on 4-21-06.

Q Okay. The next date is the date of prep. What does that mean? 01:35PM

A That's -- they immediately started the analytical procedure, which in this case means a series of dilutions, put them in an incubator and letting the plates start to grow as I understand. 01:36PM

Q And what is the date of analysis of 4-23-2006?

A I would assume that's when they actually took the plates out of the incubator and did the counts on them.

Q At what time on, if you know, can you tell from your records there, on 4-21 did the prep of the sample begin? 01:36PM

A I don't know. You can't tell from this. They got it at 9:30 a.m.

Q It was collected at 12:30 on the 20th and was received in the lab at 9:00 a.m. the following day? 01:36PM

A 9:30 a.m.

Q 9:30 a.m., okay. So a span of nine hours between collection and receipt by the lab; is that right? 01:36PM

A More than that.
Q Oh, it was 12:30 in the day, not 12:30 at night?
A Yeah.
Q So it would have been a span of 21 hours? 01:36PM
A Yeah, about 21 hours.
Q Okay. Thank you. Now, the next date is the date of the report. What does that mean?
A That's the date they generated this report, so that should reflect the same. That's when they 01:37PM
wrote this up.
Q Okay.
A This report that we see in front of us.
Q Now, if you'll turn back a page in the stack to 0002, do you see that? 01:37PM
A Yes, uh-huh.
Q Some of these reports only have date of sampling, date of receipt and date of report, no date of prep or date of analysis; do you see that difference? 01:37PM
A Yes.
Q Why is it different?
A I don't know for sure why they forgot to add that in some of these.
Q Can you tell at what time the sample that's 01:37PM

shown at 7-73.002 was collected?
A Well, this is all the same sample. This is just one sample we have here. It's just one sample, Chewy. So it was all done at the same time, just one shipment, one, you know, one, you know -- all of the different bacteria, seven different bacteria but it was just one sample that was shipped. It was sampled the same time, received at the same time, and I don't know, you know, if they had different prep times for the Campybacter (sic) versus the others ones or not. It's not reflected on here. 01:38PM
Q Dr. Olsen, did CDM follow any particular hold time procedure which precluded the use of bacteria enumeration analysis conducted more than so many days or so many hours after a sample was collected in the field? 01:39PM
A No.
Q Why not?
A We actually looked at that, and there's variable recommendations in the literature, and there's variable results depending on, you know, how long it is, depending on what program you are sampling under. So some of those are much longer than 24 hours, and that shows that there isn't any effect of bacterial data. Ultimately, you know, I 01:39PM

left it to Dr. Harwood to evaluate, you know, the quality of this particular set of data, the EML data.

Q Okay. Can you refer me to any literature that you're recalling that would specify up to a 24-hour -- did you say 24-hour hold time for bacteria? 01:39PM

A I think there's a lot of literature that specify more than a 24-hour hold time. I can get you all that. There's some up to 96 hours that show there's no difference, and because of all that literature, we did not qualify any of the data. 01:40PM

Q Okay. None of the bacteria data was qualified or rejected based on hold times; correct?

A None of EML data as far as I know. 01:40PM

Q Okay. You agree that the analysis that is occurring at EML with respect to the -- these bacteria samples is enumeration; do you understand that term?

A Yes, I think I do. 01:40PM

Q Or counting --

A Yes.

Q -- bacteria?

A Yes.

Q Okay, and you agree with me that the hold 01:40PM

times from collection until analysis on the bacteria data that was analyzed by EML exceeds eight hours?
A What were the two dates?
Q Well, no two particular dates. Are you aware -- 01:41PM
A Well, you have to look at the -- when it was received and, you know, when it was prepped versus analysis time.
Q Let me ask this.
A Because they start -- that's when the analysis really starts. You know, they get it right in the incubator and that's when -- that's the critical time. 01:41PM
Q All of the bacteria samples were collected in northeast Oklahoma or northwest Arkansas; right? 01:41PM
A Yes.
Q And the actual lab that analyzed these is located in where?
A California.
Q Okay. So I assume, unless CDM had its own plane and flew back and forth, that you Fed Ex'd these samples; is that right? 01:41PM
A Yes. In this case USGS Fed Ex'd them, the sample we're looking at.
Q Are you aware of any instance in which a lab 01:41PM

would have received a sample within eight hours of it being collected?

A Given the Fed Ex schedule, it was typically over eight hours.

Q Okay. You said that you had looked at some literature around hold times for bacteria. Did you ever consult any EPA publications or guidelines to see what they recommended? 01:42PM

A Yeah, and that's what I was referring to, the literature. Again, that's in my opinion. Once I looked at it and the actual scientific evaluations behind it, that, you know, there was variable hold times, and there was in my opinion variable recommendation times by different agencies. 01:42PM

Q Well, you agree that EPA is a credible agency in the areas of environmental sampling and analysis; right? 01:42PM

A Yes.

Q Okay. In fact, you've done considerable work for EPA, have you not? 01:42PM

A Yes.

Q You believe their standards are in keeping with the rigors of the scientific methods?

A Yes.

Q Let me refer you to what I've marked as 01:42PM

Exhibit 4 to your deposition. Can you read the title of Exhibit 4 first?

A Improved Enumeration Methods For the Recreational Water Quality Indicators, Enterococci and -- I can't even pronounce these -- E. coli. 01:43PM

Q And you do agree, do you not, Dr. Olsen, that some of the types of bacteria that were enumerated in these samples by EML were Enterococci and E. coli?

A That's correct. 01:43PM

Q Can you turn to Page 3 in this EPA publication under sample collection, preservation and storage; do you see that section?

A Yes.

Q And could you read for the Record the third sentence in that paragraph? 01:44PM

A Samples should not be held longer than six hours prior to analysis. An analysis should be completed within eight hours after collection of samples. 01:44PM

Q Did you meet EPA's recommendations as stated in this exhibit on Page 3 with respect to any of the bacteria analysis completed for this case?

A Not the EML samples.

Q Well, were there another set of samples not 01:44PM

analyzed by EML for bacteria?
A Yes.
Q Who analyzed those?
A USGS did, and they did it immediately.
Q Okay, and you believe those would have been analyzed within eight hours? 01:44PM
A Yes.
Q Dr. Olsen, in light of your failure to follow EPA's recommendation regarding holding times, what is your basis on Page 1-1 of your report, if you could turn there, for the statement that the analytical procedures are consistent with recommended methods by federal and state agencies with respect to bacteria? 01:45PM
A It's the only recommended method out there and, again, I have literature that shows that other holding times are appropriate also, and again we consulted with Dr. Harwood, who is our bacteria expert, and she was very comfortable with the -- getting these shipped Federal Express overnight to EML. 01:45PM
Q Are you aware of any contradictory statement by EPA with respect to the hold times for bacteria enumeration in water samples?
A I remember that there is, yes, in other 01:46PM

programs that I pulled up at different times if I remember right and certainly in the scientific literature where people have done the studies with different holding times there. In some cases there didn't seem to be a particular difference for a certain bacteria. 01:46PM

Q What do you mean there wouldn't be a difference for certain bacteria?

A With different holding times.

Q I still don't understand what you mean by didn't seem to be a difference. 01:46PM

A Results were not different reflecting variable holding times.

Q How can the period of holding time or the length of the holding time affect the results of bacteria samples? 01:46PM

A In most cases it's -- if they're kept cold, like they were, you may have some decrease in concentrations, though typically these numbers that we're reporting may be conservatively low. I think that was one of the reasons that Dr. Harwood was comfortable using this data. If anything, you know, we're reporting conservatively low numbers. 01:47PM

Q And is that because you believe bacteria die from the moment of collection? 01:47PM

A Again, you'd have to ask her specifically, and I do remember some studies talking about the temperature that you hold it at and what happens. I'd have to go back and look at those.

Q Did you see studies that indicate that bacteria can actually reproduce during the holding period and end up with a greater as opposed to a lesser number? 01:47PM

A The studies, if I remember right, at the 4 degrees that we hold the samples that that wasn't a problem, but I would have to go back and look at that. That's usually set up at a higher temperature but I'd have to go back and look at those studies. 01:47PM

Q Can you identify for me or did you identify in your report, perhaps is the better way to handle this, any of the studies or scientific literature that you are referring to with respect to holding times for bacteria? 01:48PM

A It's in my considered material. I'd have to dig through it to see that. 01:48PM

Q But in your report, you have not cited those; is that right?

A Not that I remember. I can look at the citations but I didn't remember specifically citing those. 01:48PM

Q Let's refer to Page 6-10 of your report, where you discuss something that you referred to as mass balance based on leaching tests. Do you recall that work?

A Yes. 01:48PM

Q Where was that work done?

A What work?

Q The leaching tests.

A Leaching tests, A & L did the actual leaching tests, but they didn't do all the analysis. We 01:48PM actually composited the samples and mixed them and then sent them to A & L as the actual sample, and they did the 20-to-1 SPLP leaching test.

Q Let's take a step back, if we can, for a moment, Dr. Olsen, and could you provide us a 01:49PM description of a leaching test and how it is conducted?

A Well, there's a lot of different leaching tests procedures.

Q Well, the ones that were conducted in this 01:49PM case, give me a description of what those tests were and how they were done.

A Okay. So your question is not leaching tests, it's synthetic precipitation leaching procedure is what you want me to describe; right? 01:49PM

Q Well, Dr. Olsen, on Page 6-10 you refer to leaching tests and I'm asking you to describe how whatever that is was conducted.

A Well, on the first -- the second sentence identify what leaching test we did, and so I'm just asking you whether you want me to discuss leaching test or you want me to discuss the specific one. The first one you just said leaching test and then you said you wanted me to describe the one I particularly used. So which one do you want? 01:50PM

Q I'm only interested in the one you did.

A Okay. That's all I want to know. It's a simple question. This particular procedure is synthetic precipitation leaching procedure, otherwise referred to as SPLP, and it's a method in SW-846, which is methods of analysis of water and wastewater, and it's Method 1312. So it is an EPA -- a method that's supposed to represent and it's designed to determine the availability of both organic and inorganic analytes present in liquid, soils and waste. So in our case we used it to determine leachate quality of waste, in this particular case, both poultry waste and cattle waste, and what this test does is it takes artificial rainwater and you mix it in with the cow 01:50PM 01:50PM 01:51PM 01:51PM

waste or the poultry waste. In this case, you know, we collected a variety of samples. They were sent to our lab in Denver and composited and well mixed, and then sent to A & L to actually add the water to them or the artificial rainfall, and they add two liters of rainwater to 100 grams of waste after it's dried and after it's reduced in diameter to less than 10 millimeters. 01:51PM

So for the dry waste we did some compositing -- I mean, for the dry cow manure we did some compositing, but they would further reduce it to make sure it was all less than 10 millimeters because that's what the procedure calls for. So it's maximizing the exposure on to the solid, and then it's rotated in a rotating machine that rotates at -- I forget the exact RPMs but it's a slow rotation of this water and solids in a bottle, and so it's mixing it as it goes along, and I think it's after 24 hours they pull that off and filter the water at 0.45 microns and analyze it for the variety of parameters we requested. 01:52PM 01:52PM 01:52PM

Q So try to put it in terms that I understand, and you'll have to bear with me because I'm a little simplistic sometimes. As a general matter, Dr. Olsen, did this test involve taking water and 01:53PM

pouring it on cattle manure or poultry litter and measuring what came off?

A No.

Q Okay.

A I described what you did. You put the two together in the bottle and you rotated it on a rotator and you determined what leached into the water and then analyzed the water. You didn't pour it on it or anything like that. 01:53PM

Q I'm sorry. Did you spread the manure for cows or the poultry litter on a field and then measure what came off or did you do it inside a lab? 01:53PM

A This is a laboratory procedure designed to represent what happens in the field.

Q Tell me about that. What did you do in terms of specifying the setup for these leachate tests to model in those tests the conditions that are present when rain falls on a pasture that either has cow manure or poultry litter in the Illinois River watershed. 01:53PM

A I did not do anything. This is an EPA standard method that says it represents -- it's used to determine the variability from solid waste. However, you know, there have been plots done of actual cattle waste and so that, you know, get -- 01:54PM

you know, unfortunately those plots have not done the type of thorough analysis we did on the leachate but they certainly have looked at phosphorus and other constituents, and so there are comparable type things from plots in the field but, again, those are artificial plots, too, in that they design the plot; they put down the plastic; they put so many cow patties on plastic and then they sprinkle water on it, you know. So that's about as close as you get to doing it in the field. But it's still, you know -- it's still a scientific experiment. In our case we did that in the laboratory. And in those case those are called field plots. 01:54PM 01:54PM

Q Let's set aside field plots. I do want to talk about those for a moment. Let's get back to the lab leachate tests that you completed. Dr. Olsen, is it your opinion that the measured concentrations of the parameters involved in this test for cattle manure and poultry litter are representative of what occurs in the real environment when rainfall interacts with poultry litter or cattle manure on a pasture? 01:55PM 01:55PM

A For most of our samples, and I'd have to check, but for the vast majority of the samples, the concentration that we measured on the edge of field 01:55PM

running off in real-world conditions were much smaller than what you get in these synthetic leachates.

Q What edge of field sampling for cow pastures did you use for comparing your cattle manure leachate samples? 01:56PM

A We didn't have any representative samples for that.

Q Okay.

A So I was talking about poultry, poultry waste. 01:56PM

Q All right. Let's talk about cattle manure for a moment. What did you do, Dr. Olsen, if anything, to confirm the representativeness of your experiment with respect to what happens to cattle manure in the Illinois River watershed when it rains? 01:56PM

A I didn't make any claim to representativeness of cattle manure in here. I did comparison in this particular section of the masses that was done under two identical sets of conditions to compare the two. However, you know, the constituents that we were getting from the cow manure, you know, they were in the few samples that -- for instance, the spring samples that had cow manure in them, too. The concentrations were much higher than the synthetic leachates, which you would expect. I mean, here you 01:56PM 01:57PM

are chunking all the cow manure up and you are exposing a lot more surface, so automatically you are going to get much higher concentrations in these than you would in real-case situations.

Q Let me ask, what you are referring to there is the comparison for your characterization of the leachate samples for cattle manure as showing high results. What were you comparing it to? 01:57PM

A The spring samples we talked about this morning that had cattle in them. 01:57PM

Q Okay. The edge of field samples?

A No. I said the spring samples. Remember, we had four samples and we read those into the Record.

Q Okay. Let me back up. Maybe I'm not giving the spring samples enough -- 01:57PM

A Yeah. I said the spring samples in my opinion were much more representative of interaction with cow manure and what would leach from cow manure than the EDFI samples.

Q Are the spring two that you are referring to, which I think is LAL16 and Spring 26, are they in your opinion representative of the impacts of cattle manure on water? 01:58PM

A Again, there's only two samples, and we're getting the same type of parameters from those 01:58PM

leachates as we are from the synthetic leachates and the same things that are in the cow. You know, we aren't getting a lot of copper because there's not a lot of copper and in poultry we do. So you go down the list, you know, and it makes sense. Just based on two samples alone, I cannot make a statement that, you know, those two are representative of cow leachate. They look like it compared to the synthetic leachates and what I know is in the solid cow manures, but I cannot with just two samples make a statement that those are representative. 01:58PM 01:58PM

Q What, if anything, Dr. Olsen, can you point the court to as being representative of the impacts of cow manure on water in the Illinois River watershed? 01:59PM

A We have those two samples and we have the solid samples. We have the synthetic leachate samples. They all give me an indication of what should leach and what should be there and what kind of signature we have, but we don't see it. There just isn't a lot of leaching of cattle waste impacting the environment, and that's why we don't see it. 01:59PM

Q When you say you don't see it, you're referring to not seeing it in your principal 01:59PM

component analysis; is that right?
A That's correct.
Q Okay, and specifically, because you've said that a time or two that you can't see it in your PCA, where would you look to see it; are you talking about a scores plot; what are you referring to? 01:59PM
A Typically I'm talking about all the evaluations that we did that there would -- in the water samples here we're talking about. We're only talking about -- we're talking about leachate. We would see a -- if it was a major, dominant contributor to the contamination in the ambient samples, we would see a group of samples that were consistent with cow, cow waste. 02:00PM
Q Where would you see that group of samples; on what type of document or report? 02:00PM
A We'd see it in the PC plots.
Q Okay. The --
A And, I mean, we have -- we have cow manure in the solid samples, and you can see it's a distinct -- very distinct from the other waste. So the solid show it. We just didn't have any except those four samples that -- and those certainly didn't create a group that would reflect anything. If there would have been a major contributor, we would have seen a 02:00PM 02:01PM

whole group of these samples in the environmental samples and it would have created a distinct pattern on the PC plots.

Q Are the PC plots you're referring to plots of PC1 versus PC2 scores? 02:01PM

A Well, we looked at a whole bunch of PC plots. You know, we looked at PC1, PC2, which were the liquids. That was the major thing, but in the solid we looked at some PC3s, too, and then typically we looked at, you know, more than just the PC1 and the 02:01PM PC2. They're all in there. The PC1 and PC2 for the liquids are the most definitive in identifying sources in my opinion.

Q Dr. Olsen, back to your leachate studies with respect to cattle manure, did those studies show 02:01PM that when cow manure is exposed to water, such as rainfall, that you would get runoff that includes concentrations of phosphorus, nitrogen, copper, zinc and arsenic?

A Can I look at the table? 02:02PM

Q Sure. You might tell us which table you are looking at when you get there.

A I've got to find it first. That would be at 6.4-2A. I think we looked at this before.

Q Okay. 02:02PM

A I think your question, first of all, it was whether rainfall would result in concentration and then you named some parameters. We'll try to remember those parameters. The first comment is that, again, these are laboratory procedures. Again we chunked up particularly the dry manure, so we're maximizing the leachate. You know, exactly what would happen in the field may be somewhat different than this, but this would -- so, you know, as far as we do get phosphorus in these leachate tests. What else did you ask about? 02:03PM 02:03PM

Q Nitrogen, copper, zinc and arsenic.

A Looks like we got -- I'd have to go back and check the data. Looks like we didn't get any nitrate plus nitrate or very little. What other did you ask about; copper? 02:04PM

Q Copper, zinc and arsenic.

A I don't see the copper number reported there. It should be, but it was probably non-detect because there just isn't a lot copper. I'd have to look that up. I have another table I can look at to look for that. 02:04PM

Q Dr. Olsen, one general question as I'm looking at this, what do all these dashes on Table 6.4-2A mean? 02:05PM

A Well, typically the dash means, as you can see in the footnote there, were not analyzed for a parameter of interest. I know this was -- these were analyzed for dissolved copper, so I don't know why that's not reported on there, but I have another table in my report that I can look for. 02:05PM

Q Unless I'm misunderstanding, and maybe I am, Dr. Olsen, but I've looked at Table 6.4-2A, and it appears to me, from what I see, you did not analyze the poultry or the cattle leachate samples for total phosphorus; am I misunderstanding something? 02:05PM

A No. Let me see. 6.4-2A. I'm looking at the second and third page. We need to get to the first page. That's what was confusing. Here we are. So we go down the left-hand column and we go over to dissolved copper, and we see that, for instance, the dry -- on the dry manure that it was chunked up. There were five samples that underwent the leachate, and there was -- there was a little copper in it, very, very little. 02:06PM

Q In the cow manure?

A Yeah, compared to very large concentrations in the SPLP from the poultry. What was the next one?

Q Zinc and arsenic.

A Zinc, dissolved zinc, again a little zinc, 02:06PM

but --
Q In the cow manure?
A In the cow manure, but very, very small compared to what's in the poultry. Next one?
Q I haven't heard about phosphorus yet. What about phosphorus; did you get phosphorus in cow manure when you poured water on it? 02:07PM
A I think I already answered that, but let's check the number for sure here. That would be soluble reactive phosphorus. Yes, again, we get phosphorus, and I'm looking at soluble reactive phosphorus, about 4,500, but again it's much smaller than compared to same type of leachates with poultry. 02:07PM
Q Did you understand my question to ask for a comparative analysis? 02:07PM
A No. I added that.
Q Okay. What about total arsenic; did you get -- or dissolved arsenic. Did you get arsenic out of a cow manure when you poured water on it? 02:08PM
A Again, we didn't pour water on it. I've already clarified that with you. You want me to redescribe that?
Q You exposed it to water; correct?
A We added it to water. You want me to 02:08PM

redescribe that?

Q No, I have no desire for you to use additional time that I need. Dr. Olsen, did you get arsenic out of cow manure when you exposed it to water?

A When we did the SPLP, which this table reports, I will look right now. No, we did not. 02:08PM

Q Let's go to Page 6-12. There's a table at the top of Page 6-12 that's entitled Cattle Contribution to Leachable Parameter Masses. Do you see that?

A Yes. 02:09PM

Q And it has some percentages of the cattle contribution, as I understand it, compared to some poultry contribution; is that right?

A That's correct.

Q Okay, and you've got a poultry high and a poultry low; right? 02:09PM

A That's right.

Q Okay. How was this table generated?

A First of all, there's an errata table for this, so we shouldn't use these numbers in the Record. 02:09PM

Q Let me ask this: Did you change your methodology in terms of how you computed the numbers between your original report and your supplemental or errata report? 02:09PM

A No.
Q Okay. So I'm interested at this point as to how you got to the numbers, not what the numbers are.
A Sure. 02:10PM
Q Tell me how you got there.
A I'm going to read in here just to make sure that I get it right here. I'll make some notes as I go along to make sure I have it right. First of all, from Dr. Engels (sic) we had the relative 02:10PM amount of masses of both cattle waste and poultry waste.
Q Okay. Can you provide us with the relative amount of masses for those two that you used in your calculations? 02:10PM
A Yes. It's -- I'm reading right now in the last paragraph on 6-10 and so the poultry mass ranged from 354,000 tons to 500,000 tons, so that's what I'm referring to using the 354,000 tons. Going back to the table here, that's that number that was 02:11PM used in the poultry low limit.
Q Okay.
A And the 500,000 tons was used in the poultry high limit. So that's the only difference between those two columns. 02:11PM

Q Okay. Thank you. Now, what about the cattle number?
A It's 319,000 tons.
Q And do I understand that for purposes of your analysis that -- and your calculations, you have assumed that cattle generate in the Illinois River watershed 319,000 tons of cattle manure; is that right? 02:11PM
A That's right.
Q And you got that number from Dr. Engel? 02:11PM
A That's right.
Q Okay, and you have assumed that poultry litter in the Illinois River watershed amounts to between 354,000 tons and 500,000 tons; correct?
A That's correct. 02:12PM
Q And those are the two beginning points in your calculation; correct?
A Yes.
Q Okay. If those numbers are not realistic, either one of them, are your calculations unrealistic? 02:12PM
A If those numbers are different, I would get different numbers.
Q Okay.
A I don't know, you know, exactly what you mean 02:12PM

by unrealistic. I assume you mean they're different than what I have here.

Q Sure, but not just slightly different, but substantially different?

A Okay, yeah, they would change these numbers. The more the difference, the more they would change. 02:12PM

Q And so, for example, if the cattle contribution of manure to the Illinois River watershed was a million tons instead of 350 -- I'm sorry, 319,000 tons, what would that do to the percentages that you express in the table on Page 6-12? 02:13PM

A The cattle contribution percentages would go up if the poultry percent -- if the poultry tons stayed the same. 02:13PM

Q Where did Dr. Engel get the 319,000 tons of cattle manure estimate?

A There's an estimate in one of his appendix. I don't remember the details of how he got that.

Q Did you investigate that at all or did you just take Dr. Engel at his word? 02:13PM

A I used his word for that.

Q All right. Now, what's the next step in your calculation? Once you start with the assumed amount of manure from these two sources, what did you do 02:13PM

next?
A You have to put those manures on the same basis so they were -- the poultry waste had to be corrected for the dry weight, which was the same as the 319,000 tons of cattle waste that Dr. Engel reported. That was dry weight. So I converted the poultry weight to dry weight by using the moisture content from our analysis of poultry waste that we collected in the basin. 02:14PM
Q What did you get as the dry weight of poultry litter after you converted it? 02:14PM
A I'd have to go look at the spreadsheet.
Q It would be less than 354?
A Yes.
Q Okay. So the 354,000 tons is a wet weight number; is that right? 02:14PM
A Yeah, it's as disposed, wet weight or whatever it is as disposed. I mean, it isn't -- it doesn't have a lot of moisture in it. You know, this stuff is pretty -- doesn't have a lot of moisture content when it's disposed, but to make it comparable, I had to do that correction. 02:14PM
Q Okay. What did you do after you converted the poultry litter number to dry weight?
A We actually took the results in 02:15PM

concentrations, and they had various units of the SPLPs as reported in Table 6.4-2A. So those are all liquid units, milligrams per litter, nanograms per litter, MNN, you know, maximum probable number of bacteria per hundred milliliters. So we used the units that they were reported in and multiplied that by the liquid-to-solid ratio or essentially you're multiplying milligrams per liter, that's the concentrations reported from the lab in the SPLP times this 20-to-1 ratio, which is really liters to grams, so the liters cancel out, and so now you are left with a concentration in mass, milligrams or nanograms that the lab reported, per gram of waste material because you used 100 grams of waste material, and now you go in and take the amount of waste material, the tons that we were just talking about, and make the appropriate conversions to grams or kilograms, and so you are just left with a mass. For instance, you start with milligrams per liter of copper. You would be left with a mass from that leach test of copper. 02:15PM 02:16PM 02:16PM 02:16PM

Q Would you be left with a mass for each source being studied, cattle and then poultry?

A For each test we would be left -- we had a number that we could work with. 02:16PM

Q What did -- I'm trying to understand what these percentages mean. When you say that the cattle contributions from copper is .3 percent of the poultry load limit, what does that mean?

A Okay. Well, we weren't finished with the calculation. 02:17PM

Q Oh, I'm sorry. I thought you were at the end. Keep going.

A No. We're just to the mass, and those mass numbers are reported on -- this was an errata, too -- 64-7A and B. You really need to look at the errata because there's some mistakes on here, but the same calculation was made, but these numbers are not correct, and sometimes the units aren't correct, but essentially doing the calculations I did, you can see that we have a low limit and a high limit for how much poultry mass was generated. These are actually mass numbers, and they average based on the two samples we had for poultry waste, they average based on the five samples we had for fresh manure and the five samples we had for dry manure. So we actually have one, two, three, four different mass numbers to compare, and how I did that was I assumed that there were 90 percent dry patties on the field and 10 percent fresh patties, and so -- 02:17PM 02:18PM 02:18PM 02:19PM

Q Can I stop you there and ask a question?
A Yeah.
Q What's your basis for that assumption?
A I talked to Darren Brown about his observations when he was out there and other people about their general observations out there, and I don't know. It depends on how long they've been running cattle on the field and things like that, but overall I thought that was an appropriate combination of materials for an illustration. 02:19PM
Q Did Darren Brown actually count dry versus wet cow patties?
A Well, they did, and I don't know if he talked to someone else but, you know, when we collected from these five fields, you know, they were looking for both so they had a good feel for, you know, how many wet ones they found and how many dry ones they found. So I think he talked to some of the samplers based on the five fields that they were at on the relative number of each. 02:20PM
Q Did he actually record those counts somewhere?
A No.
Q Okay. Other than the anecdotal information provided by Mr. Brown, what support do you have for your assumption that on a typical field you would 02:20PM

have 10 percent wet and 90 percent dry cow patties?
A Again, that's kind of based on my understanding, this may be conservative, that poultry application has been going on over ten years at most of these fields and so they probably have been running cattle for that many years. So, you know, automatically, depending on the amount of cattle you have, which, again, I understand from Bert Fisher has been pretty constant over the last ten years that you may have ten times more dry than wet. You may even have more dry than wet, but that's the basis of my assumption and that's why I put it here. 02:20PM 02:20PM
Q So the basis of your assumption about wet versus dry cattle manure is the length of the time that you understand poultry litter has been used; did I understand that correctly? 02:21PM
A Well, it's based on -- again, you asked me for another basis for the reasoning, and I already gave you the first one based on observations, and then the other thing was just reasoning how long cows have been on these fields. 02:21PM
Q What's the definition or dividing line in your analysis between a dry cow pie and a wet?
A Well, if you were out there, you could 02:21PM

probably tell, right. A dry cow pattie you can pick up. A wet one you have to scrape up.

Q Well, how did you make those differentiations in your analysis? Surely you used some sort of objective criteria? 02:21PM

A Again, that's how they collect them in the field. You know, they made sure they got dry patties that were -- when you got in the lab, you could see the difference. They were, you know, chunky; they were dry, and the wet ones, you know, 02:22PM it was all sloppy, you know, so they were fresh and, you know, so it's really fresh, and that's what I say, fresh versus dry. So I mean, you could tell when there's a fresh cow pattie out there, and that's what they got. They got the brand new ones 02:22PM out there, and you could tell when there was a dry patty. It's pretty easy to do that in the field.

Q There's no scientific moisture content that you're referring to for the difference between fresh and dry? 02:22PM

A No. It's field observation, you know. It was fresh, you know. It smelled better, you know. It was wet. It was, you know -- you step in it, it would squash.

Q Why did you need to assume differing 02:22PM

percentages in your analysis of fresh versus dry?
A I didn't have to. I could have -- in the table we're looking at, I could have done a column and said one was based on fresh and one was based on dry, you know, and then we would have had four columns versus two, and I thought this was a reasonable way to condense the data that may be more representative because we know that, you know, it isn't all fresh and we know that it isn't all dry, so -- 02:23PM
Q I didn't mean to cut you off.
A Go ahead.
Q You got different concentrations of constituents in your tests based upon whether the cattle manure being experimented on was fresh or dry; correct? 02:23PM
A Yes. That's why we have the two mass columns here and the two concentrations in the tables.
Q And in your analysis of this mass balance calculation, you, for 90 percent of the calculations, used the results of the test on dry cattle manure; correct? 02:23PM
A No. I took the 90 times the mass in the corrected table on 6.4-7A. Those are mass numbers. So I took 90 percent of that number, plus 10 percent 02:24PM

of the fresh number for a particular parameter, and that's the total.

Q Okay. Let's take -- I'm sorry. Were you through?

A No -- yeah. I could have done -- you know, a different combination essentially wouldn't have changed the numbers that much or the conclusion. 02:24PM

Q If you assumed more fresh, a greater percentage of fresh, the cattle contribution would have gone up; correct? 02:24PM

A Depends on what parameter you are looking at. Some -- it depends on -- I'd have to go back and look at -- the fresh stuff was always greater than the dry stuff. I don't think it was in all parameters, but for most of it it was. 02:24PM

Q I'm sorry, I didn't mean to talk over you. It was with respect to phosphorus; correct?

A We can go back and look at that table. I don't want to get this all confused. Soluble reactive phosphorus, it was -- the dry was just a little bit less than the fresh for phosphorus. 02:25PM

Q So if you had used the -- a greater proportion of fresh in your analysis, your percentage of contribution for cattle to phosphorus would have gone up; correct? 02:25PM

A A little.
Q How much is a little?
A I can calculate it if you want me to but not very much.
Q Let's take a break. 02:25PM
VIDEOGRAPHER: We're now off the Record. The time is 2:26 p.m.
(Following a short recess at 2:25 p.m., proceedings continued on the Record at 2:34 p.m.)
VIDEOGRAPHER: We are back on the Record. 02:34PM
The time is 2:34 p.m.
Q Dr. Olsen, on Page 6-12 of your report you refer to a field test study published by T. J. Sauer; do you see that?
A Yes. 02:34PM
Q Okay, and you say that the results of your leachate study are consistent with the results reported by T. J. Sauer in his field test; is that correct?
A Yes. 02:34PM
Q Okay. Have you actually reviewed the paper by T. J. Sauer?
A Yes, I have.
Q Let me hand you a copy of what I've marked as Exhibit 5 to your deposition, which for the Record 02:35PM

is an article entitled Poultry Litter and Grazing Animal Waste Effects on Runoff Water Quality published in the Journal of Environmental Quality in 1999. Is this the paper to which you were referring? 02:35PM

A Yes.

Q Is this paper based upon a field plot study?

A Yes.

Q This involved actually applying poultry litter and cow feces to the land and then measuring runoff; 02:35PM is that right?

A If I remember rightly, yes.

Q What type of animal on the bovine species was involved in this study; was it beef cow?

A Looks like it was dairy. 02:35PM

Q How much dairy farming is there in the Illinois River watershed?

A Not a lot.

Q Do you agree the predominant type of cattle operation in the Illinois River watershed is beef 02:36PM cattle?

A That's correct.

Q Okay.

A I say that, you know, dairy cattle runoff in my text here. 02:36PM

Q What was the rainfall that was simulated, the amount of rainfall in this study; do you know?
A I'll have to look through it here.
Q Let me refer you to the next to the last page, Page 864 under conclusions. Do you see the reference to application of a 25-year storm? 02:36PM
A Yes.
Q Okay. Is it your understanding, Dr. Olsen, that the results that are reported in this paper are intended to simulate runoff after a 25-year storm? 02:37PM
A I don't know. I'd have to go back and look because there's a reference -- you've underlined that, too -- to a second storm, and it doesn't say what that second storm represented.
Q Are you suggesting by your citation to this paper, Dr. Olsen, that the results of this study are representative of what runs off of either a poultry litter amended field or a beef cattle grazing pasture during a typical rainfall that occurs in the Illinois River watershed? 02:37PM
A No.
Q Okay. In this particular field plot study, there were two applications of water; correct?
A If I remember correctly, yes.
Q Do you see again on Page 864 in the column on 02:37PM

the right-hand side that there's an underlined sentence?

A Yes.

Q Could you read that sentence, please?

A A second storm two weeks later resulted in much smaller nutrient losses and fewer significant difference between treatments. 02:38PM

Q What's being referred to there as fewer significant differences between treatments; what are the treatments? 02:38PM

A Well, there were a variety of treatments here. There was a control field. There was a DFU field, so that's a different treatment. There's a PL field. There's a DFU plus PL field. That's another treatment. So these are the different types of treatments that he was talking about here. 02:38PM

Q And as a general matter, do I understand the authors of this paper to be making the observation that in the second simulated rainfall, they got less differences in the amount or concentration of constituents running off of poultry litter amended fields and fields that had received dairy manure? 02:38PM

A I'm trying to figure that out, if that's what they meant or not. Dairy feces is DFU. Poultry litter is PL. The concentrations decreased, and it 02:39PM

looks like depending what parameter you look at, the differences between magnesium are the same between the first and second. Concentrations between -- SPR are decreased but they're still quite different with poultry being in this case six times more than the first case, .8 times -- well, here the difference is more greater for phosphorus in the second experiment than in the first. The differences of nitrate are less in the second experiment. The difference of ammonia are less in the second experiment. So it's very general statement. And you have to look at each individual parameter on the differences are more and some of them are less, and it depends on whether he's talking about relative percent differences or magnitude actual concentration differences, and so I was trying to go back to the exact data and figure out what he meant there for sure. 02:40PM 02:40PM 02:40PM

Q Can you -- there's some qualifying or cautionary statements at the very end in the conclusion section of this report. The last two sentences, could you read those, please? 02:41PM

A Clearly grazing intensity and waste deposition patters create potential for a large degree of spatial and temporal variability of nutrient runoff 02:41PM

from grazed pastures. Further studies in this area are warranted, especially as the potential for a nutrient runoff from applied poultry litter diminishes with time after application; whereas, grazing animals continue to deposit waste on the soil surface throughout the growing season. 02:41PM

Q How did you take those observations into account in your leachable mass analysis?

A What I was doing here is saying, and I took the average of both, the first and the second treatments of water, and just gave some factors by which poultry waste plots at higher concentrations than the nitrogen -- excuse me, than cow, and that's the only thing I was trying to make is that typically, you know, in our synthetic studies, we saw that poultry waste at higher concentrations than cattle waste, and I was trying to say here's another study that, from the data I see, shows the same thing, and that's all I was trying to apply. I didn't go any further than that and analyze, you know, what season or whatever it was. It's a comparative plot study out there. 02:41PM 02:42PM 02:42PM

Q Dr. Olsen, you don't disagree, do you, that the differences in the timing at which cattle manure is deposited in comparison to poultry litter affect 02:42PM

the ultimate contribution that those two different sources can have to run off?

A The timing in relation to a rainstorm, yes.

Q Poultry litter is applied typically how frequently? 02:43PM

A It's typically applied once a year.

Q Okay, and how regularly is cattle manure applied?

A Through the grazing season.

Q Cattle don't defecate -- I'm sorry, what's the grazing season? 02:43PM

A I assume they don't graze them all year long, but I don't know that. You know, I don't know that for sure, if they -- I think they supplement the feed in the winter, but maybe they're still pooping on the field. Maybe they're still in the fields. I don't know that for sure. 02:43PM

Q I'm assuming if a cow is taking something in, it's letting something out; do you agree?

A Yeah, yeah. I just -- 02:43PM

Q Okay. Do you have any reason to disagree that cattle manure is being applied every day in the Illinois River watershed?

A Yes, but, again, it's a different application as far as leachability as we show in the test. 02:44PM

Q You referenced your errata earlier, and you did submit a twelve-page errata report on July 25th of 2008. Can you tell me why you submitted that errata?

A I find typos, and in the case of this table, I found a spreadsheet error. 02:44PM

Q Okay. What was the spreadsheet error?

A There were a couple of things unknown to me. The graduate -- the person that was doing this calculation, Jess Jeppson, and she actually checked the calculations with another person, you know, before I saw them, and I assumed that when I said a ton, it was a metric ton, and so that affected the calculation. There were a couple other small manipulations she did wrong once I checked it. 02:44PM 02:45PM

Q What did you really mean when you said a ton?

A It's a pound ton or it has another terminology, but essentially it's 2,000 pounds.

Q And a metric ton is how many pounds?

A It's a thousand kilograms, so that's 2.2 -- 2,200. There were a couple other -- I think another one was how she used the dry weight, the moisture content to correct for dry weight. I'd have to go back -- 02:45PM

Q What was the mistake there? 02:45PM

A I think she divided instead of times, but it wasn't consistent on how she did it.
Q And how did you discover these mistakes?
A I was checking numbers myself versus her having someone else check them. 02:46PM
Q You didn't check them before you put them in your report?
A I didn't have time to check every spreadsheet that went in this report. I typically wrote the equations down, had her follow them and had her 02:46PM check those calculations with someone else. There was a checking process. In some cases it turns out that both people got it wrong.
Q And this is the same -- you said Jessica Jeppson? 02:46PM
A Yes.
Q That wrote other parts of your report?
A Yes.
Q Turn to Section 6.4.3.5. I think, Dr. Olsen, you told us earlier this is a section you wrote 02:47PM yourself; right?
A Yes.
Q Okay, and in this section of your report, you are offering opinions about hazardous substances in poultry litter; is that a fair summary? 02:47PM

A Yes.
Q Okay, and on Page 6-16 you refer to a table that is described as the 302.4 table?
A Yes.
Q What is that? 02:47PM
A That's the -- in CERCLA that's the list of hazardous substances and reportable quantities.
Q Under CERCLA; is that what you said?
A Yes.
Q Okay. So is this as a general matter where you go to determine what substances are hazardous substances under CERCLA? 02:47PM
A Yes.
Q Okay, and is it your understanding that in order to be regulated under CERCLA, it has to be listed on this table? 02:47PM
MR. PAGE: Object to the form.
MR. GEORGE: What was the objection, David?
MR. PAGE: To the form.
MR. GEORGE: You want to expound on that and I get a chance to correct my question. 02:47PM
MR. PAGE: Asking a legal conclusion.
MR. GEORGE: I asked for his understanding.
Q Answer if you can, Dr. Olsen.
A That's what I was going to say. As I 02:48PM

understand, that's a legal interpretation. From my understanding, if it's listed on that table, it is subject to CERCLA regulations.

Q Now, you list some substances on tables -- I'm sorry, on Page 6-16 that you claim are on the hazardous substance list; correct? 02:48PM

A There are some that are also chemical form and chemical combinations on that list.

Q Well, did you actually review the Table 302.4?

A Yes. 02:48PM

Q Okay.

A For instance, arsenic and compounds is not on that list, but it would be an associated chemical form of arsenic.

Q Is that right, that arsenic and compounds is not listed? 02:48PM

A If I remember right. I can look at that list if you want me to. Well, no, arsenic and compounds is listed. I'm sorry. It's phosphorus and compounds that's not listed. 02:49PM

Q Okay. Now, let's be precise here because on Page 6-16, you list as a hazardous substance under CERCLA, about two-thirds of the way down, phosphorus and compounds. Do you see that?

A Yes. 02:49PM

Q Is that how it's actually listed on the CERCLA 302.4 table?
A No.
Q You added and compounds to that listing, did you not? 02:49PM
A No. I specified what I was going to do up there, and I did what I was going to do. It says in this list that I had below here includes not only specific chemicals listed but also chemical compounds, chemical forms and chemical combinations 02:49PM of listed chemicals.
Q And what's your basis for doing that?
A As I understand, there's legal precedence for doing that.
Q Are you a lawyer? 02:50PM
A No.
Q Who has told you there's legal precedent for that?
A David Page told me.
Q Okay. Did he provide you with any of this 02:50PM legal precedent?
A I did not independently review that.
Q Did he provide you something and you didn't review it?
A No. 02:50PM

Q Okay. Mr. Page just told you that if the table said -- if a 302 table said phosphorus, that that meant phosphorus and compounds?
A No, that isn't what he told me. He told me exactly that chemical compounds, chemical forms and chemical combinations, that list of chemicals have been determined to be hazardous substances. 02:50PM
Q But now we don't have any disagreement, do we, Dr. Olsen, that if you actually go look at the 302 table, you will see phosphorus but not phosphorus and compounds; is that right? 02:50PM
A Yes, and that's what -- I indicate that in the bottom paragraph.
Q Phosphoric acid is a specifically listed phosphorus compound, is it not? 02:51PM
A That's right, and the chemical form of that, the phosphate from the fields, is identical to the chemical form of phosphoric acid is.
Q We're going to talk about that.
A Okay.
Q Did CDM test for phosphoric acid in poultry litter?
A I know we checked for three varieties of phosphorus.
Q Okay. There is an actual test that you can 02:51PM

run for phosphoric acid in poultry litter; right?
A Not that I know of.
Q You can't test for phosphoric acid?
A Not that I know of.
Q Okay. You don't -- in light of that and in light of your previous statement, you don't have any report that you can provide to the court that shows phosphoric acid was detected in poultry litter, do you? 02:51PM
A No, but we analyzed for phosphate, and phosphoric acid exists in the environment as the hydrogen phosphate ions just like phosphate in poultry waste does. So it exists in the same form, and that's what you test for. You don't test for phosphoric acid. You test for the phosphate. 02:51PM 02:52PM
Q What type of phosphate?
A There's a whole bunch of variety of phosphates depending on -- there's soluble reactive phosphorus, which is typically orthophosphate, which includes PO4 minus 3; it includes H2P04-minus. It includes HPO4 2-minus. So it includes all those forms wrapped up into one analysis, and the only difference is that those all are proportioned depending on the pH, and they're all three there, some of them more than other depending on the pH of 02:52PM 02:52PM

the solution.
Q Well, help me because I'm not a chemist. Dr. Olsen, what is the chemical formula for phosphoric acid?
A H3PO4. 02:52PM
Q Did you find H3PO4 in poultry litter?
A It would not exist in poultry litter. Phosphoric acid would not exist unless it's at a very low pH if it existed in the forms that we tested for. 02:53PM
Q Okay. You didn't find H3PO4 in poultry litter; correct?
A We didn't test for it.
Q Well, if you didn't test for it, you couldn't have found it; right? 02:53PM
A Well, it's different than not finding it.
Q Okay. Did you find H3PO4 in any soil sample from a field where poultry litter had been applied?
A It wouldn't have existed. We didn't have low enough pHs. It would have converted -- if it was 02:53PM there, it would have converted to H2PO4-minus and HPO4 double-minus. So that's what you would have found in the environment.
Q H2PO4 is phosphate; is that right?
A H2PO4? 02:53PM

Q Yes, sir.
A That's dihydrogen phosphate is the correct word for it.
Q What's the correct description of HPO4?
A Hydrogen phosphate, and they are both anions, so you should add the word anion to that. 02:54PM
Q And if I understand your statement at the bottom on Page 6-16, you believe at a certain pH level, that phosphate will exist as either dihydrogen phosphate or hydrogen phosphate; correct? 02:54PM
A That's correct.
Q Okay. What is that pH level?
A Well, at a neutral pH, you have both. As you get to a higher pH, you get more of the H versus the H2, and you get to the lower pH, you get more of the H2 than the H for them. So there's an equilibrium concentration that they're 50-50. At pH -- I forget exactly how much of one you have for the other one, but there's a set percentage of one versus the other. 02:54PM 02:55PM
Q Okay. The very last sentence of this section you say at the same pH value. What do you mean same pH value; what pH?
A Assuming a pH of 7, neutral pH.
Q Assuming a neutral pH, these chemicals -- I 02:55PM

assume you are referring to dihydrophosphate and hydrogen phosphate?

A Dihydrogen phosphate, yeah.

Q These chemicals -- these chemical forms and proportions of these chemical forms are identical to the chemical forms and proportions of the listed substance, phosphoric acid; do you see that? 02:55PM

A That's right.

Q What do you mean by that?

A What I mean is that the phosphate that we measured, the orthophosphate we measured in poultry litter, edge of field samples, water samples, in the environment at any pH, and here I just use the example of the neutral pH would actually exist in the liquid form in the environment as these two elements, and if you put phosphoric acid into the environment, it would be identical to those two forms. 02:55PM 02:56PM

Q Okay. So your opinion here is if you introduce phosphoric acid into the environment, it converts to either dihydrogen phosphate or hydrogen phosphate; is that what you are saying? 02:56PM

A Yes.

Q Okay. You are not saying that when you put poultry litter that contains a phosphate into the 02:56PM

environment, that it converts to phosphoric acid?
A Well, these are the weak acids. So it converts to these weak acid forms. It doesn't convert to the H3PO4. It would if you add low enough pH. 02:57PM
Q Just so we're clear, you're not offering the opinion that what is phosphate in poultry litter becomes H3PO4 or phosphoric acid in the environment?
A No.
Q Let's turn to Page 2-49 of your report. 02:57PM
A 2-49.
Q Don't lose heart but we are going backwards. And in Section 2.13.1.4 -- do you see that section?
A Yes, sir.
Q You refer to reference streams; do you see that? 02:58PM
A Yes, sir.
Q What do you mean by reference streams and how are they used in your evaluation in this case?
A By reference streams, we are trying to find streams comparable in geographic providence and environment to the streams in the IRW without any poultry waste application. 02:58PM
Q Okay. In the typical scientific setting, is a reference stream kind of like a control? I've heard 02:59PM

that term.
A Yes, we could have called these controls.
Q Okay, and a control is where -- just so we're making a Record here, a control is where you have -- you're evaluating a variable and you do some evaluations on one setting that has the variable and one setting that doesn't; right? 02:59PM
A Yes.
Q Okay, and what is the variable that you were trying to test or evaluate with respect to your control or reference streams? 02:59PM
A Again, like I just said, is that they were similar or they were similar in a variety of ways, but the difference in parameter we were trying to test is that the reference streams had very low or no poultry waste application. 02:59PM
Q Okay.
A And typically we use the surrogate of poultry house density.
Q And in a traditional scientific setting with respect to a control, do you try to match all other variables other than the one you are testing as best you can? 03:00PM
A Yes.
Q Okay. So in this setting, with respect to a 03:00PM

reference or control stream, you would look for a water body that has similar effects with the exception of poultry litter; is that right?

A Yes, and particularly make sure it was still in the Ozark Plateau area. It was same type of order stream of some that we were sampling. Those were the main type of physical criteria we looked for.

Q Okay, and on Page 2-50 you identify three reference streams for comparison to the Illinois River; do you see that?

A That's correct.

Q Just for the Record, what are those three streams?

A Reference Site 1, which was same as RS 10003, Little Lee Creek, and then another place on Little Lee Creek that was sampled, so essentially in similar areas, RS 10004, and Reference 02 is Dry Creek, which is north in the Buffalo Creek watershed, and Reference 3, which is east of the site, is Spring Creek. Excuse me. I got those backward. Spring Creek is north of the site, and the reference to Dry Creek is in Arkansas, the Buffalo River watershed. Sorry about that.

Q Dr. Olsen, is it your understanding or your

03:00PM 03:00PM 03:01PM 03:01PM 03:01PM

opinion that these three streams are minimally impacted by poultry production in the land application of poultry waste?

A As you see on the figures I provided, there's some poultry houses, just a few in the Little Lee Creek watershed and a few more in the Spring Creek. I don't think we identified any in the Dry Creek area, and certainly from the chemical constituents, Dry Creek turned out to be, chemistry-wise anyway, the -- probably the best reference, but I considered them all in my analysis as reference -- appropriate reference streams. 03:02PM

Q And does that consideration mean that they are minimally impacted by poultry production in the land application of poultry waste? 03:02PM

A The chemical constituents that I saw, that it was minimally impacted, yes.

Q Well, Dr. Olsen, did you make that determination of minimal impact by looking at the water quality data or looking at the actual land use and poultry production? 03:03PM

A They were selected based on poultry house density, and then I looked at the water quality data to confirm that they were minimally impacted, and in my analysis, I made sure that all the ones that I 03:03PM

said were impacted with poultry were -- had higher concentrations than those.

Q Okay. Dr. Olsen, with the exception of impacts from poultry litter application, are these three streams otherwise comparable to streams in the Illinois River watershed? 03:03PM

A As far as being in the same geological province, I understand they are. As far as relative size, they don't -- of course, we can't get reference streams reflecting all the different sizes we have, and I think these are kind of the middle type of size streams we have. I forget exactly what order they are, but they kind of represent not the really small streams, not the really big, but kind of in the middle, if I remember right. So that's what they kind of represent. 03:04PM

Q Dr. Olsen, do any of the three reference streams that you used in your analysis receive discharges of sewage from point sources like the Illinois River does? 03:04PM

A I certainly didn't see any impact of point sources in the chemical analysis.

Q Well, did you check publicly available data to see if any POTW actually discharges sewage into those reference streams? 03:04PM

A No, I didn't.
Q Why would that not be important to your analysis?
A I don't think there was, but I should probably check that, but certainly, as you already know, I can see clearly when there's wastewater discharge into streams by the chemical analysis, and none of these streams reflected that. So I would be very surprised if there was any wastewater point source of discharges. 03:04PM 03:05PM
Q So when you say you can see in the chemical analysis, are you referring again to your PCA?
A And the general chemical quality.
Q Okay. So do I understand, Dr. Olsen, that rather than check publicly available sources as to whether there are or are not point sources in these streams, you relied upon your ability to interpret chemical data? 03:05PM
A I assume that other people have done that, but I didn't independently check it myself. 03:05PM
Q Did you select these reference streams or did someone else?
A These were recommended by other people. I did not select them.
Q Who recommended them? 03:05PM

A As I say in here, the State recommended them, and then our team followed up, the biological team in particular followed up but, you know, the biologists met with the Oklahoma Water Source Board and Oklahoma Department of Wildlife Conservation and determined their recommendations, and they recommended Spring Creek and Little Lee Creek. I'm reading the paragraph here, and then the biologists went out and checked these all to make sure that they were suitable for the specific biological sampling that they would be doing in terms of a lot of different things besides the things I mentioned. 03:06PM

Q Dr. Olsen, who are the biologists that you're referring to?

A If I remember right, this was done by Ron French and Tony Gendusa. 03:06PM

Q And Ron French works at CDM. Where does Tony Gendusa work?

A Tony works for CDM, too. He's our senior aquatic biologist. 03:06PM

Q In what office?

A He's actually in our Arkansas office.

Q You have an Arkansas office?

A Yes.

Q Where is that? 03:06PM

A Hot Springs, I think. He's the -- he is the office. We may have another office there. I don't know for sure.

Q You referred both in your report and in your comment a moment ago to representatives with the Oklahoma Water Resources Board and the Oklahoma Department of Wildlife Conservation perhaps having input into the selection of the reference streams; is that right? 03:07PM

A Yes. They recommended Spring Creek and Little Lee Creek. 03:07PM

Q Were you at the meeting -- I'm sorry. Were you in attendance at the meeting with the Oklahoma agency officials where these recommendations were provided? 03:07PM

A Not that I remember.

Q Okay. Do you know who at OWRB or the Wildlife Conservation Department recommended Spring Creek, Lee Creek and Dry Creek as reference streams for your analysis? 03:07PM

A Let the Record be straight. They did not recommend Dry Creek. They only recommended Spring Creek and Little Lee Creek as it says there, and I don't remember. I wasn't present at those meetings that I remember. 03:08PM

Q You don't know who made that recommendation?
A No.
Q Okay. Do you know what those individuals were told about the purpose of your analysis and how these reference streams would be used in your analysis? 03:08PM
A I don't -- wasn't present at that meeting.
Q Who represented -- I'm sorry. Who recommended Dry Creek in Arkansas?
A I don't remember how that came about. I think we're looking for a third stream, and people were looking for, again, primary criteria where there wasn't any poultry waste disposal, and Buffalo Creek basin came up as a potential area. So Ron French went over there and looked at that basin to determine whether it was appropriate for his sampling or not. 03:08PM
Q How do you determine that, whether it was appropriate?
A Again, you looked at the various physical primers on the stream. We also checked with -- I think we checked with Bert Fisher on the geology, the bedrock geology and looked at the land use. The biology was interested in, you know, how big the stream was, and all these we did some preliminary 03:09PM

checking of water quality and sediment quality on it to determine whether they were good reference streams or not.

Q Let me inquire about that. Why would the quality of the water in terms of its chemical composition be a relevant factor in selecting a control or a reference stream to evaluate the impacts that poultry litter has on water quality in the Illinois River? 03:09PM

A Because we wanted an impacted stream -- an unimpacted stream as our reference. 03:09PM

Q Why did you want an unimpacted stream?

A That's what a control is.

Q Well, shouldn't you have sought a stream that was unimpacted by poultry but otherwise have the additional impacts that the Illinois River has? 03:10PM

A Again, I don't understand, you know. Our main variable was poultry, and we wanted a totally unimpacted stream, so we could look at all the sources in the Illinois. 03:10PM

Q So, Dr. Olsen, the objective in selecting or one of the objectives in selecting a reference stream was to find the cleanest stream; is that right?

A Not the cleanest stream. A representative 03:10PM

stream that was unimpacted.
Q Unimpacted by any source?
A Yeah, by sources.
Q Okay. Are you representing, Dr. Olsen, that the water quality in these three reference streams 03:10PM
resembles what the Illinois River streams would look like in the absence of poultry but with all of the other sources still in existence?
A No.
Q Do any of the three streams that you've listed 03:11PM
as reference streams run through watersheds that have human population densities comparable to the human population density in the Illinois River watershed?
A Well, certain parts of the Illinois River 03:11PM
watershed, certainly. The urban areas certainly not. So they do represent portions of the Illinois River watershed. They don't represent those few urban areas of the watershed.
Q Okay. Fair to say that these three reference 03:11PM
streams would represent the largely uninhabited portions of the Illinois River watershed?
A I wouldn't say uninhabited but low, not urban, non-urban type areas for sure.
Q None of your reference streams have watersheds 03:12PM

that have the population density that you see in the upper reaches of the Illinois River watershed?

A No.

Q Okay. How do the cattle population densities of these three watersheds compare to the Illinois River watershed? 03:12PM

A We did not determine cattle population density.

Q Why not?

A Again, our screening criteria was essentially no sources or low impact streams which we verified again. As I said, if there was wastewater in the stream, if there was large impact of cattle, if there was a large impact of poultry, we would have seen it in our preliminary analysis, which we didn't see. 03:12PM

Q And when you say you would have seen it, you are referring to your PCA analysis?

A No. Just looking at the quality. We had not done the PCA by then. 03:12PM

Q Did you -- laying aside the water chemistry for a moment, let's focus on the land. Did you actually investigate the extent to which cattle are grazed in any of the three watersheds?

A I personally didn't do it. I didn't know 03:13PM

whether Ron French with the Oklahoma Water Resource Board or the Oklahoma Department of Wildlife Conservation did it. Seems like the Department of Wildlife Conservation knows something about that, but I wasn't present at those meetings so I don't know if that was discussed or not.

Q You don't know whether that was evaluated or not?

A No.

Q Okay. Dr. Olsen, if you compare the Illinois River with a reference river or stream that has little human influences from POTWs, urban areas, cattle, septic systems and human populations, what does that tell you? 03:13PM

A It tells you the quality, if everything else is similar, that the streams would have been without those things. 03:13PM

Q Okay. Your reference stream analysis at best would tell us what water quality might look like in the Illinois River if there were reduced numbers of humans, septic tanks, POTWs, cattle and poultry; is that right? 03:14PM

A Again, the cattle doesn't matter that much and the septic tanks don't matter that much. So it really kind of represents what would be there if 03:14PM

there weren't any wastewater or poultry.
Q Dr. Olsen, is there any poultry farming occurring in any of these three reference stream watersheds?
A Yes. 03:14PM
Q And could you turn to Figure 2.13-1.
A Okay.
Q What is Figure 2.13-1A, B? Let's just stay with those two, 1A and 1B.
A 1A shows the reference sites RF 1 and RS 10004 in the basin and with poultry houses in that basin based on aerial photography. 03:16PM
Q Okay. What direction does the Little Lee Creek flow?
A It flows south in that area. 03:16PM
Q It flows from north to south?
A Yes.
Q Okay, and I see your reference stream location, sampling locations are reflected as 1 -- I guess it's it actually 10003? 03:16PM
A Right.
Q And 10004; is that right?
A That's right.
Q Okay. Upstream of those samples there are, if I'm reading your map correctly, five poultry houses; 03:16PM

is that right?
A Yeah, looks like there's five, and I need to confirm whether 10003 -- I need to confirm, you know, what side of the basin our 10003 was on for sure. I was going to do that today but I haven't had time to do that. 03:17PM
Q Okay.
A If it's in -- to the right of that black line, it shows the basin drainage area. It would drain the area that those houses are on the very upgradient end in. 03:17PM
Q Okay. Turn to the next figure, which is 2.1-1B.
A Uh-huh.
Q And what is this? 03:17PM
A This is the second -- the third reference location. This is north of the site, and so this is Spring Creek.
Q And, Dr. Olsen, what direction does Spring Creek flow? 03:18PM
A It flows towards the -- towards the southwest.
Q Okay, and this particular map, if I'm reading the legend down at the bottom correctly, shows that there are about 35 poultry houses in the Spring Creek watershed; is that right? 03:18PM

A Well, this doesn't show the whole watershed.
Q Okay. I'm sorry. In the area in which the reference samples were taken, there are 35 poultry houses; is that right?
A I'd have to count. I don't know. 03:18PM
Q Do you see -- maybe I'm misreading this. Do you see at the very bottom of this chart, it looks like it's reported.
A Number of poultry house on station in subwatershed. It says the subwatershed, so I don't 03:18PM know exactly what that is. I think it's saying what's shown on this picture is 35.
Q 35 poultry houses?
A Yeah.
Q Okay, and a good number of those 35 houses are 03:19PM upstream from the reference sampling location; is that right?
A Yes.
Q Now, I don't see a map for Dry Creek watershed. Why? 03:19PM
A No poultry houses in that watershed if I was told right.
Q Well, did you confirm that?
A I can reconfirm that.
Q Well, my question is, Dr. Olsen, did you 03:19PM

confirm it before you wrote your report and offered opinions?

A Yeah. That's why there isn't a map in here, if I remember the conversation right, but I could recheck that. I'll have to recheck that. 03:19PM

Q All right. As we sit here today, you believe you have investigated the issue and determined there are no poultry houses in the Dry Creek watershed, which is a tributary to the Buffalo River; right?

A That's my recollection. 03:20PM

Q Okay. Do you know what happens from the -- I'm sorry. Dr. Olsen, do you know what happens to the litter that is generated in the poultry houses shown on your maps for the Little Lee Creek and the Spring Creek reference streams watersheds? 03:20PM

A No, I do not know.

Q Now, you collected water samples from the streams that you refer to as your reference streams; correct?

A Yes. 03:20PM

Q And did you analyze the water from all of the reference streams that you collected for the 26 constituents that you used in your principal component analysis?

A There were six samples that ended up in the 03:20PM

principal component analysis.
Q Six -- I'm sorry. Go ahead.
A There were more samples than that taken but some of them were taken through a set of eleven parameters, and some of them had the data rejected and there wasn't enough parameters. So we ended up with six total. 03:21PM
Q Six stream samples from reference streams; correct?
A That's correct, uh-huh. 03:21PM
Q That were used in the PCA analysis?
A That's correct, uh-huh.
Q And were those samples taken from all three of the reference streams?
A Yes. 03:21PM
Q Okay. So you have a sample in your PCA analysis from Dry Creek, Lee Creek and Spring Creek; is that right?
A One or more, yes.
Q Okay. Were those samples that are used in your PCA analysis and collected from the reference streams taken during base flow or high flow conditions? 03:21PM
A I can look at that analysis, but I think most of them were base flow-type conditions. 03:21PM

Q Why would you -- go ahead.
A But we qualified that, and so I can tell you if I look at the database which one is which.
Q What do you mean you qualified that?
A Well, we characterized every sample of river as either base flow or high flow. I just don't remember, but I think most of those were base flow. 03:22PM
Q What was the purpose of running those six reference stream samples through your PCA?
A That was used -- well, first of all, if they're reference streams, they should give a very low PC score, and there should be a gradient between those and contaminated streams by poultry waste and other waste and, sure enough, without me doing anything at all to manipulate the PCA or anything like that, Dry Creek, you know, had the very lowest score. So then the other ones had a typical little higher score, which again reflects concentrations, increased concentrations of parameters, so there may be some impact to those, but in my final analysis, where I determined that -- which streams were potentially impacted by poultry and which ones weren't in the IRW, I made sure that the ones that I selected all had higher scores than any of the reference streams, even though the reference streams 03:22PM 03:22PM 03:23PM 03:23PM

may have showed a little impact. So it was, in my opinion, a conservative analysis of which ones were impacted by poultry.

Q Is it your scientific opinion, Dr. Olsen, that you cannot find the chemical signature for impacts from poultry litter in the water samples collected from your reference streams? 03:23PM

A There's some chemical signature, but that's why I used the reference streams, to make sure that chemical signature was below what I said was impacted by poultry samples. So I made sure that that chemical signature wasn't by my -- that's one of the criteria I used, is compare it to reference streams, and so I always made sure that the ones I said were potentially impacted had high enough scores that they were above the reference stream scores. 03:23PM 03:24PM

Q So how is it, Dr. Olsen, that in the Spring Creek watershed where you have 35 poultry houses in the vicinity of where the reference stream samples were collected, you could not find the chemical signature for poultry litter? 03:24PM

A I did.

Q You found it in --

A It was a very low signature, and so to be 03:24PM

conservative, I said that -- you know, I'm going to say that anything that has a score similar to any of the reference streams as a conservative analysis is not impacted by poultry.

Q Okay. How low of a PC1 score can you have and you still conclude that there is some impact from poultry litter? 03:25PM

A That's all explained in my analysis, and the cutoff on the surface water scores was 1.3, and it's actually 1.30226, something like that. 03:25PM

Q But all of your reference stream samples came in below 1.3; correct?

A That's right.

Q But you just told me that even those samples are showing to some extent a chemical signature for poultry litter; right? 03:25PM

A Potentially, but that's the cutoff I used because I was trying to be conservative. So it's a conservative analysis, and as you can see on the PC plots, there's a gradient, the scores, and I could have made it lower and included more surface waters that I thought were potentially impacted, but to be conservative -- and there was some in-basin internal, like High Flow Station 30, that was selected as a reference, an in-basin reference, that 03:25PM 03:26PM

90 percent of the samples from that basin were also below the 1.3. So I compared all those numbers, every last one of those numbers, chemical quality, and just went up the list from the bottom up and from the top down and determined what would be in my opinion a conservative cut-off. 03:26PM

Q I appreciate the conservativity, but how low could you have gone and it still be scientifically defensible in your view, Dr. Olsen, in terms of a PC1 score to identify that sample as impacted by poultry litter? 03:26PM

A I didn't determine that.

Q Okay. The only number that you determined for dividing impacted to non-impacted is 1.3; correct?

A 1.30226, yeah. 03:27PM

Q Okay, and let's use 1.3.

A Yeah, that's fine. That's what I did in the text. You're exactly right.

Q And your reference stream locations came in below 1.3; correct? 03:27PM

A Yes.

Q And so, Dr. Olsen, is it your opinion that these are impacted or not impacted by poultry waste?

A Well, Dry Creek for sure doesn't look impacted. It had a score of one, and that's -- the 03:27PM

other ones may have some minor, very minor contamination, some very minor poultry impact. To be sure, I said, you know, let's make the criteria high enough that, you know, we're for sure not in my opinion including anything as unimpacted that 03:27PM
actually is impacted. So I didn't want to make -- I wanted to have a conservative-type analysis here, and I didn't go through and, you know, look at -- I did pretty thoroughly the chemistry and all those and I didn't -- there was one that was approaching 03:28PM
1.3 but the other ones were really pretty low. As I say in the text, High Flow Station 30 was I think ten out of eleven times. There was another high flow station, which we did have high flow samples from, again, very, very minimal impact compared to a 03:28PM
lot of other places. So by looking at all of that, that's my spatial-type analysis, I determined 1.3 was an appropriate cut-off.

Q Dr. Olsen, what is the primary mechanism for transport of poultry litter from fields to streams 03:28PM
in Oklahoma?

A There's a couple of transport mechanism.

Q The primary one.

A Most of it is from runoff from the fields.

Q Okay, and runoff occurs when it rains; is that 03:29PM

right?
A Yes, yes.
Q And you didn't collect any high flow samples from your reference streams that you used in your PCA? 03:29PM
A Yeah, but I have 15 to 20 high flow samples from other in basin reference areas.
Q In the reference streams?
A Not in those three reference streams. In HFS 30 I have high flow samples that were deemed 03:29PM reference areas, internal reference areas, and I think I discuss that in here somewhere.
Q Let's stay with the three reference streams for a moment that are discussed in your report. Does it surprise you, Dr. Olsen, that you cannot 03:29PM find the chemical signature above 1.3 for poultry litter from base flow samples collected in those three streams?
A Does it surprise me what again? Restate that. Sorry. 03:29PM
Q Does it surprise you that you cannot find the chemical signature as you have defined it for poultry litter contamination in base flow as opposed to high flow samples in those three streams?
A Does it surprise me that I can't find the 03:30PM

chemicals?
Q Yes, sir.
A Again, we've said there's some contamination there. It was so low that I was conservative that I cut it off at 1.3. It doesn't surprise me. You know, looking at the maps, those are pretty far away, and the poultry house density isn't that much and, frankly, that's why we are looking at the chemistry and, you know, we don't exactly know where the waste was disposed of. Dry Creek makes -- they all make perfectly sense as far as chemical quality that they aren't impacted or minimally impacted. 03:30PM 03:30PM
Q Dr. Olsen, if you really wanted to test the validity of your chemical signature using your PCA analysis for poultry litter contamination, why would you not go to a watershed that has little or no poultry and take high flow and edge of field samples and analyze them in your PCA? 03:30PM
A We did do high flow samples from a basin that had little or no poultry. 03:31PM
Q From a watershed or a subbasin in the Illinois River watershed?
A Well, you said watershed. Yeah, I collected it from a watershed in the basin in the Illinois River that had little poultry density, and those 03:31PM

were used in analysis of the PCA to create my cut-off numbers. Frankly, there are more of those than there are, you know, the few reference ones we've been talking about. So there's a lot of data from those. 03:31PM

Q Did you test your PCA analysis on any watershed outside the Illinois River watershed during high flow conditions in a watershed that contains little or no poultry?

A Not outside. We did inside. 03:31PM

Q Can you state with the utmost confidence, Dr. Olsen, that the watersheds that you have identified within the Illinois River watershed as reference areas have received no poultry litter?

A In the Illinois River watershed? 03:32PM

Q Yes, sir.

A No. They're based, again, on chicken house density and so they had minimal chicken -- excuse me, based on chicken houses, so they had minimal chicken houses in the basin and, again, the water 03:32PM quality did show some impact but it was very, very minimal, and I was conservative and drew a line that was high that didn't include any of those that even had minimal impact.

Q So, Dr. Olsen, with respect to the subbasins 03:32PM

in the Illinois River watershed that you are referring to as reference watersheds --

A Yes.

Q -- you don't know, do you, sir, whether or not poultry litter has been applied in those basins? 03:32PM

A No, I do not know specifically, but they did show some contamination but very minimal.

Q Let's take a break and change tape.

VIDEOGRAPHER: We are now off the Record. The time is 3:33 p.m. 03:33PM

(Following a short recess at 3:33 p.m., proceedings continued on the Record at 3:42 p.m.)

VIDEOGRAPHER: We are back on the Record. The time is 3:42 p.m.

Q Dr. Olsen, could you turn to Section 2.13.2 of your expert report. 03:42PM

A Okay.

Q And on that page and the following few pages, Dr. Olsen, you are discussing what I'd refer to and what I think you refer to as reference lakes? 03:42PM

A Yes.

Q Okay. Were you involved in the identification of the Broken Bow Reservoir as the reference lake for this investigation?

A Not substantially. I remember listening in on 03:42PM

a couple of conversations, but I did not. I did not finalize the selection of that.

Q Dr. Olsen, who on the team of experts was most responsible for making the decision to select Broken Bow as the reference lake for this evaluation? 03:43PM

A There was a team of people, including Ron French, Bert Fisher, Denny Cooke and Gene Welch, and so as the experts, I think it boiled down to Gene and Denny, Dr. Welch and Dr. Cooke, but I again wasn't completely involved in all of those 03:43PM determinations.

Q Okay, and what was the purpose of sampling a reference lake and an investigation like the one you consider conducting in this case?

A This one was mostly to compare biological data 03:43PM on including -- I'm including the DO and the other profile information with the biological data to Lake Tenkiller.

Q Well, you also in your report provide some comparison of other more standard water quality 03:44PM parameters, such as nutrients; correct?

A Oh, yes, there was nutrients, too. I'm sorry, I forgot those.

Q And as a general matter, Dr. Olsen, was the point of selecting a reference lake the same as you 03:44PM

described earlier for a reference stream, to evaluate a water quality in a reservoir that is unimpacted by poultry litter?

A Or minimally impacted by poultry.

Q Okay. What do you mean by minimally impacted by poultry? 03:44PM

A As I understand, there's -- there are some poultry houses in the upper part of this watershed so, again, you can't -- unfortunately, you know, trying to stay with similar lakes and similar 03:44PM rivers, it's hard to find places that aren't having a poultry impact. So in this case I understood, you know, they had to settle for a lake that was minimally impacted, and then they verified that with the water quality. 03:45PM

Q Okay, but you can't provide me with an objective measure or criteria for determining whether Broken Bow or any other reservoir is, quote, minimally impacted by poultry litter?

A I know they were looking at the DO profiles, 03:45PM and this has a very high, strong concentration of DO, so I think that was the first thing they looked at, and then they looked at the phosphorus concentrations. Those were very low. I know the benthic organisms were much higher than Tenkiller. 03:45PM

So all those things that you would expect when the analysis was in made it look like a good reference reservoir but, again, that's more of Dr. Cooke and Dr. Welch's opinion how good it was.

Q Dr. Olsen, my question was objective criteria to delineate impacted versus unimpacted by poultry litter reservoirs. Can you provide one? 03:46PM

A Well, they put together a table and it's reproduced in here that they used to select, and I don't know whether that had criteria in it or was just a comparison to try to get something similar to Tenkiller. 03:46PM

Q I'm going to try one more time. Do you know of an objective criteria that was used to determine whether or not Broken Bow was impacted or unimpacted by poultry litter? 03:46PM

A You should ask Dr. Cooke and Dr. Welch, you know, what that table is supposed to reflect that I put in here.

Q I'm going to go for the fourth time. Do you know? 03:46PM

A No, I don't know. I assume, like I've already said, phosphorus, DO. I said all those things. So that's my understanding, but the ultimate determination, like I testified, was Dr. Cooke or 03:47PM

Dr. Welch.

Q Dr. Olsen, if you would stick to answering my questions instead of telling me what you want me to hear about things I haven't asked about, this would go much faster. 03:47PM

A I'm sorry, but I'll try to do better.

Q All right. Was Broken Bow the first reservoir that was selected as a reference lake for this investigation?

A No. 03:47PM

Q What was the first reservoir selected?

A Lake Stockton.

Q And on Page 2-55 you say Dr. Jack Jones from U of M identified Lake Stockton as a lake having potentially minimal inputs from the land application 03:47PM of poultry waste; do you see that?

A Yes.

Q And did you investigate that statement by Dr. Jones and confirm it as correct?

A I did not personally investigate that and, 03:47PM again, another person on our team or Dr. Welch or Dr. Cooke could have potentially done that.

Q Let's turn to Table 2.13.3 of your report.

A Okay.

Q What is Table 2.13-3? 03:48PM

A That was the table I was referring to that I understand that was constructed to help assist in screening various reservoirs for an appropriate -- appropriate reference reservoir. So that's what I was referring to, that this table may have some criteria that Dr. Cooke and Dr. Welch would have used. 03:49PM

Q Okay, and do you see any objective criteria that you were referring to in terms of water quality on this table? 03:49PM

A Well, you'd have to ask them. There's total P. There's average chlorophyll-a. There's poultry house population. There's all kinds of things here that they would have evaluated that I would call criteria. 03:49PM

Q But you'll agree with me that what we see on Table 2.13-3 is a reporting of information about each of the lakes being considered in comparison with Lake Tenkiller; do you agree with that?

A Yes. 03:49PM

Q It does not establish a threshold or cutoff for objective criteria around any of those characteristics, does it?

A You're right.

Q Okay. With respect to the poultry population 03:50PM

in the Lake Stockton watershed, what does Table 2.13-3 show?

A It shows poultry production --

Q Let's include both broilers and turkeys.

A Poultry population, broiler sales are 30,725. Turkey sales are 79,061. 03:50PM

Q So you agree with me as a general matter about 110,000 poultry and turkey are sold annually in the Lake Stockton watershed; is that right?

A Yes, that's my understanding. 03:50PM

Q And the Lake Stockton watershed is how large in comparison to the Illinois River watershed?

A Drainage area -- did you ask about Broken Bow?

Q No. Table Rock -- I'm sorry, not Table Rock. Lake Stockton. 03:51PM

A 1,150 square miles compared to Tenkiller, which is bigger, 1,610. You did ask me to compare them; right?

Q Yes, I did.

A Okay.

Q Now, what about Broken Bow; what's the watershed size for Broken Bow?

A 754 square miles.

Q Okay, and what is the poultry population reported on this table for Broken Bow watershed? 03:51PM

A 30,727,935.
Q Okay. So did I understand correctly, Dr. Olsen, in selecting Broken Bow as the appropriate reference lake for this evaluation, you selected a -- over Lake Stockton a reservoir that is smaller and has 30 million more poultry raised in it annually? 03:52PM
MR. PAGE: Object to the form.
A Yeah, there's a lot of misstatements in that. To start with, Stockton Lake was selected first as a reference. 03:52PM
Q But you discarded that eventually; correct?
A I didn't. Again, the experts did. Once they started looking at the data, they found that there were point sources of phosphorus, so it couldn't be used. Then they discussed all this, the team of people I said, and, yes, they did select Broken Bow as a potential reference reservoir. 03:52PM
Q And they selected Broken Bow despite the fact that it has substantially more poultry raised in it and it is a smaller watershed; correct? 03:52PM
MR. PAGE: Object to the form.
Q Is that correct?
A Again, you'll have to ask them about how they selected this. I don't know the criteria they did. 03:53PM

I know they were specifically looking at water quality to determine the impact to Broken Bow, and they were looking at where the poultry was produced compared to the reservoir. So I know they looked at all that. I don't know exactly or what they did and how they finally determined Broken Bow. 03:53PM

Q Dr. Olsen, I didn't ask you about their criteria. I asked you about what they did and you know what they did, correct, in terms of which reservoir they selected? 03:53PM

MR. PAGE: Object to the form.

A Yes. I already stated they potentially selected Broken Bow, but I don't know why they did.

Q I didn't ask you why they did. Dr. Olsen, with respect to this table, you can confirm from looking at it, can you not, that the poultry density, number of birds per square mile in Broken Bow is substantially greater than Lake Stockton? 03:53PM

MR. PAGE: Object to the form.

A The numbers are there. I mean, you can make the same conclusion. I'm just saying that when you ask me to use the word despite, that, you know, I had to tell you what they did is my understanding, and I know they did other things and looked at only poultry production. 03:54PM

Q We're going to keep reading these questions back until they get answered.

MR. GEORGE: Can you read that back, please?

A I answered that question.

Q No. I want you to listen closely, Dr. Olsen, to my question and answer it.

(Whereupon, the court reporter read back the previous question.)

A And my answer was you can see it and it's obvious on the table that that's true. 03:54PM

Q Okay.

A And that's the first thing I said. So I think that's an answer to your question.

Q Dr. Olsen, what is the purpose in Table 2.13-3 of capturing information on the cattle population, swine population and -- let's stay with those two, cattle population and swine population for the reference lakes under consideration? 03:55PM

MR. PAGE: Object to the form. 03:55PM

A Again, looking at potential other sources in the basin.

Q Okay, and you agree that you should look at other potential sources in the basin in evaluating a reference watershed; correct? 03:55PM

MR. PAGE: Object to the form.
A Yes, you should be aware of other potential sources in the basin.
Q How does the age of Broken Bow Reservoir compare to Tenkiller Reservoir as shown on Table 2.13-3? 03:56PM
A Are you talking about year constructed?
Q Yes, sir.
A I can read the table. Broken Bow is 1970 and Tenkiller is 1952. 03:56PM
Q So would you agree, Dr. Olsen, that Broken Bow Reservoir is 18 years younger than Lake Tenkiller Reservoir?
A It was constructed 18 years after Broken Bow. As far as you're talking about the physical condition or when the dam was constructed, yes, the dam was constructed, and it is a younger pool of water. I don't -- 03:56PM
Q Why is that relevant to the analysis in selecting a reference lake? 03:57PM
MR. PAGE: Object to the form.
A Again, you'll have to ask Dr. Cooke and Dr. Welch what they did with that, if anything.
Q Do you acknowledge that just given the differences in age that Lake Tenkiller has 03:57PM

accumulated material from inputs from its tributaries for 18 years longer than Lake Broken Bow?

MR. PAGE: Object to the form.

A Accumulated materials, you mean runoff? 03:57PM

Q Runoff, sediments.

A I was just trying to clarify what you meant by materials.

MR. PAGE: Same objection.

A Those mechanisms, yes, those mechanisms have been occurring over a longer period. Whether more was accumulated, you know, I don't know. 03:57PM

Q The table that we've been discussing includes a row for EPA eco region. Do you see that?

A Yes. 03:58PM

Q What is that?

A Again, I'm not familiar, except that the EPA has divided the whole country into eco regions and given them numbers, and this just reflects that eco region province these watersheds are in. I don't know exactly how they did that. 03:58PM

Q Does an eco region have any geological significance; do you know?

A I don't know how they constructed those.

Q Okay. Is it true, Dr. Olsen, that Lake 03:58PM

Stockton is in the same EPA eco region as Lake Tenkiller?

A Yes. According to this table, they are both in the Ozark Highlands.

Q And is the reservoir that was ultimately selected as the reference lake, Broken Bow, in the same EPA eco region as Lake Tenkiller? 03:59PM

A No. It's in a different one.

Q Dr. Olsen, is Broken Bow comparable to Lake Tenkiller in terms of the size of the lakes? 03:59PM

MR. PAGE: Object to the form.

A The storage flood control pool in terms of acre feet is similar. The storage multi-purpose pool is littler on Tenkiller than Broken Bow.

Q So are those comparable or not in your scientific judgment? 04:00PM

A You'd have to ask Dr. Welch and Cooke what's comparable.

Q Well, Dr. Olsen, your report is the one that talks about reference lakes, and I want to know whether you consider the two that you're comparing to be comparable in terms of the size of the lakes. 04:00PM

MR. PAGE: Object to the form.

A As I said, I depended on Dr. Cooke and Welch and other people to make that determination. 04:00PM

Q So you don't have an opinion on that subject?
A No, I don't know. I mean, the flood control pool is a relative percent difference of, you know, about 15 percent. That's pretty comparable, but you'd have to ask a limnologist if that's comparable enough, and I'm not a limnologist. 04:00PM
Q Dr. Olsen, is the watershed to lake area ratio for Broken Bow comparable to Lake Tenkiller?
MR. PAGE: Object to the form.
A I don't see that number in here. 04:00PM
Q You'd have to compare two numbers, which would be the surface area and the drainage area?
A I don't know that that's what you are supposed to do to compute that. If you want me to compute those two numbers and compare them, I can do that. 04:01PM
Q Well, as we sit here today, do you have an opinion as to whether the lake surface area to watershed area for those two reservoirs is comparable?
A I haven't done that calculation. 04:01PM
Q Is that another way of saying you don't have an opinion today?
A If I haven't done the calculation, I don't have an opinion.
Q Okay. Dr. Olsen, do you have an opinion on 04:01PM

the -- on whether the cattle population per square mile for Broken Bow is comparable to Tenkiller?

A Again, I could do that calculation very quickly here. It's something I can do. Let's see if I can form an opinion. For Broken Bow, I get about 63. 04:01PM

Q Per square mile?

A Per square mile for cattle population, and for Tenkiller I get 91. You'd have to ask, you know -- in my opinion, you know, since cattle don't contribute that much and there isn't that many cattle, it isn't a significant difference, but again the ultimate determination of how they used those numbers would be up to Dr. Welch and Cooke. 04:02PM

Q Dr. Olsen, do you consider the 31 million head of poultry raised annually in the Broken Bow watershed to satisfy the criteria for a watershed that has, quote, little or no poultry? 04:03PM

A No. Those are significant, in my opinion significant values. So those would have to be evaluated in detail what impact it had on the reservoir. As I understand, that poultry population didn't have that much impact on the reservoir. 04:04PM

Q How is that possible, Dr. Olsen, that 31 million head of poultry could be raised in a 04:04PM

watershed in northeast Oklahoma without significant water quality impacts?

A You know, these are way up in the headwaters, and I don't know what specifically happens between the headwaters and the distance to the reservoir, but I know that that was considered and looked at, and the phosphorus doesn't get transported into the reservoir for particular reasons. I don't remember those reasons. 04:04PM

Q Does the phosphorus in poultry litter from those farms just evaporate? 04:05PM

MR. PAGE: Object to the form.

A No. I think it's tied up in the soils and the sediments, but I did not do that detailed evaluation. 04:05PM

Q Who did?

A I know Bert Fisher looked at that particular evaluation of why that -- where the poultry houses were and how that got transported and why there wasn't the concentration in the reservoir. The ultimate determination was there was high P concentrations in the reservoir if I remember. 04:05PM

Q Dr. Olsen, I'm going to hand you what we'll mark as Exhibit 6 to your deposition.

MR. GEORGE: And for the Record, David, 04:05PM

there's a handwritten notation 15 with a circle on it. That's mine, and I meant to have it eliminated from the document before I had it reproduced but failed to, so you can disregard that. I've covered it up with the exhibit sticker on the witness' copy. 04:06PM

Q Do you recognize Exhibit No. 6, Dr. Olsen?

A No.

Q Have you ever seen it before to your knowledge?

A Not to my knowledge. 04:06PM

Q Dr. Fisher represented in his or testified in his deposition the Xs on this map show the location of poultry houses in the Broken Bow watershed.

A Okay.

Q You were unaware of this piece of information when you selected or participated in the selection of Broken Bow as a reference lake; is that right? 04:06PM

MR. PAGE: Object to the form.

A No. I already testified I was aware that there were poultry houses in the upper part of the basin. 04:06PM

Q You see there are a good number of poultry houses located along the tributary, Mountain Fork, that feeds Broken Bow Reservoir?

A Yes, and they're all in the upper part of the 04:07PM

basin.
Q Why is that significant to you?
A Well, it was characterized to me, if I remember the conversation, that -- and, again, you'll have to ask Bert Fisher his explanation of why the phosphorus did not get transported to the reservoir, but it had something to do with the location and some other reasons. I don't remember all those reasons nor did I participate in conversations that may have explained all those reasons. 04:07PM
Q So if I understand what you've said, and if I misunderstand it, you'll correct me. Someone told you there are a good number of poultry houses but the phosphorus from those houses doesn't make it to the water; is that fair? 04:07PM
A Well, I know that it doesn't make it to the water because of the concentrations in the lake.
Q Okay. Let's go back to Lake Stockton for a moment, which was the originally selected reference lake. Why was it stricken as the reference lake for this investigation? 04:07PM
A There were concentrations of phosphorus in the reservoir that were related to point sources.
Q What were the concentrations of phosphorus? 04:08PM

A I don't remember for sure. They were -- I just don't remember what they were, but they were -- I don't remember what they were.

Q Do you recall if they were comparable to the phosphorus concentrations in Lake Tenkiller? 04:08PM

A I don't remember.

Q Okay, but they were certainly higher than the phosphorus concentrations in Broken Bow Reservoir; is that right?

A Yes, that's correct. I do remember that. 04:08PM

Q Why exactly would high phosphorus concentrations preclude or weight against using Lake Stockton as a reference lake for this evaluation?

MR. PAGE: Object to the form.

A As I understand from Dr. Cooke and Dr. Welch, 04:08PM phosphorus is what -- concentrations in the reservoir is what really drives the classification of the reservoir as far as eutrophic/non-eutrophic in the analysis they did.

Q I understand that, but if I recall your 04:09PM testimony correctly, you told me that you were setting up a control here to evaluate the effects of poultry litter on phosphorus levels, among other things, in Lake Tenkiller; correct?

MR. PAGE: Object to the form. 04:09PM

A I think the testimony was minimally impacted. So when we found it was impacted by a source, in this case it was wastewater treatment source, that was not a good reference area.

Q Because it had a wastewater treatment facility discharging into it? 04:09PM

A No, because it had impact of phosphorus in the reservoir.

Q Well, you'll agree with me, will you not, Dr. Olsen, that Lake Tenkiller receives the inputs, including phosphorus, from point sources? 04:09PM

A Yeah, but, again, our whole discussion of control reservoirs is to try to find reservoirs without, and the whole discussion on streams, and same discussion holds for reservoirs, you are trying to find water bodies where there are streams or lakes that aren't impacted in a reference area or control area, same way with soils. 04:10PM

Q Okay. If I understand correctly, Dr. Olsen, you were looking for a lake that was unimpacted in terms of phosphorus by any source, not just poultry? 04:10PM

MR. PAGE: Object to the form.

Q Is that right?

A In terms of any contamination?

Q You were looking for the cleanest lake you 04:10PM

could find in terms of phosphorus concentration; is that right?

MR. PAGE: Object to the form.

A No, that isn't what I said. I said minimally impacted, and Lake Stockton was definitely impacted. 04:10PM

Q Does that suggest something to you that Lake Stockton, that has a low, virtually nonexistent population of poultry, was impacted in terms of phosphorus?

MR. PAGE: Object to the form. 04:11PM

A Does that what?

Q Suggest something to you as a scientist.

MR. PAGE: Same objection.

A Certainly that there's other sources of phosphorus besides poultry, and we certainly 04:11PM considered those in Tenkiller. We looked at wastewater treatment plants.

Q And isn't that indeed why Lake Stockton was delisted as the reference lake is because an evaluation of that lake would show that phosphorus 04:11PM concentrations can be associated with things other than poultry?

MR. PAGE: Object to the form.

A Certainly not. We were looking for an unimpacted lake. I stated that very clearly. You 04:11PM

can't --

Q What type of point source was discharging into Lake Stockton?

MR. PAGE: Object to the form.

A As I understand it, it was a point source. I thought it was a wastewater treatment plant, but thinking back, I don't know exactly what type of point source it was. 04:11PM

Q Do you know if it was a municipal point source? 04:12PM

A I don't know for sure.

Q Do you know the size of the point source?

A No, I do not.

Q Do you know how the number of people serviced by that point source compares to the number of people serviced by the point source in the Illinois River watershed? 04:12PM

A No, I don't.

Q Did you analyze the water and sediment samples collected from the Broken Bow Reservoir and Lake Stockton for the same suite of parameters that you use in your principal component analysis for Lake Tenkiller? 04:12PM

A No.

Q Why not? 04:12PM

A We just were doing a limited sampling for the -- essentially for Denny Cooke and Gene Welch to assess the condition of the reservoir, and they didn't need the full suite of parameters.

Q Well, Dr. Olsen, were you not interested in seeing whether you could find what you call your poultry litter chemical signature in Lake Stockton, which has very little poultry or in Broken Bow, which has -- what you say is largely unimpacted by poultry? 04:13PM

A Was I interested in --

Q Yes, sir.

A In what?

Q In seeing whether you could find your poultry litter chemical signature in a lake that doesn't receive poultry litter impacts. 04:13PM

A I thought about it and weighed the cost of the analysis and what I would get out of it, and the sampling was so limited and, again, I thought I had good signature analysis by the ambient data within the Illinois River basin and didn't need that additional data, given the cost of it and what was going to be done out there. They really weren't geared to getting that data. They were only geared to getting the limited amount of data that we did. 04:13PM 04:14PM

Q How much more would it have cost you to gather a couple of samples from Lake Stockton and examine them for the 26 parameters?

A See, that's the problem. The program that they had was very limited, and given the number of samples I would have had, I don't think it would have been a definitive enough analysis. So that was one of the reasons, you know, it just wasn't -- given the time that we did Broken Bow and the few samples that we collected. Essentially they were verifying a lot of what was already known about Broken Bow, and so they had a comparison, and they didn't need huge amounts of samples, but no one has done the extensive analysis on Broken Bow, so I didn't have a dataset to go on, and the few times they would be out there, I didn't think would be an adequate characterization to put in a PCA analysis. 04:14PM 04:14PM 04:15PM

Q Do you think you answered my question, which was how much would it have cost you?

A That's what I was trying to answer. I was trying to figure out how many samples I would need. I don't have a determination specifically. I would have to think, think more about how much it would have cost. 04:15PM

Q Would it be less than $10,000? 04:15PM

A Probably be more than 10,000.
Q Less than 50,000?
A Probably less than $50,000.
Q And how much money has been spent on sampling in this case? 04:15PM
A I don't know the exact number for sampling.
Q Millions of dollars; correct?
A Yes.
Q Okay. Is it not true, Dr. Olsen, that one way to test the validity of your chemical signature for 04:16PM poultry litter would be to gather samples, water samples from Lake Stockton, which has virtually no poultry in its watershed and run your PCA and see if we see what you are calling the chemical signature for poultry? 04:16PM
A We already have reference water samples. I suppose we could have added Lake Stockton, but I thought, again, our analysis of reference waters were very adequate for what we already had. So I didn't think that I needed additional water samples 04:16PM as references, particularly given all the in-basin ones I had that were very appropriate in my opinion.
MR. GEORGE: Lisa, could you read back that question.
Q And, Dr. Olsen, I'm going to ask you to listen

to it carefully and to answer it, please.

(Whereupon, the court reporter read back the previous question.)

A Would that be a validation? I was trying to say that it wouldn't particularly be a validation. It would be -- because I've already validated that reference samples don't show the poultry signature. So that's what I said in my answer, that it potentially would have been another reference sample that we could have used. I thought I had enough. 04:17PM

Q Let's approach it this way, Dr. Olsen: If we found, using a PCA, the chemical signature for poultry litter in samples taken from Lake Stockton, that would call into question, would it not, whether what you are seeing in your PCA is indeed the chemical signature for poultry? 04:17PM

MR. PAGE: Object to the form.

A That's a hypothetical that wouldn't happen in my opinion because of what I know about poultry waste and how distinguishable it is from others. So if you did that and assuming that it had a signature, which is a hypothetical which I don't think would ever exist, I would have to evaluate that sample to see why it was similar, and I don't think it would call into question my whole analysis. 04:18PM 04:18PM

I have a hundred samples that identify that chemical signature.

Q How did you test your poultry litter chemical signature outside of the Illinois River watershed, Dr. Olsen? 04:18PM

MR. PAGE: Object to the form.

A One of the evaluations that I did was compare it to the reference areas.

Q The base flow samples that you took from streams? 04:19PM

A Yeah, and the reference areas in the basin, too, which you just asked about outside the basin.

Q Outside of the Illinois River watershed, did you do anything to test the validity of your chemical signature for poultry litter other than the 04:19PM base flow samples in the reference streams?

A That was the major, one of the major evaluations that I did. That was the only -- well, there are other samples outside the basin that, again, fit the analysis that I did, and there's some 04:19PM edge of field outside the basin, so there's other samples outside the basin that, again, fit inside or fit with the analysis I did besides the reference. I think that was your question.

Q Did you run your PCA on edge of field samples 04:20PM

taken outside of the basin?
A There were a couple that were outside the basin.
Q Where were the field samples collected?
A They're on the maps. I think they're called Colcord 1 and 2. They're on the figures if you want me to look. Do you want me to look it up so I get the right names? 04:20PM
Q Please. What are you referring to Dr. Olsen?
A This is Figure 2.3-1. Yeah, right at the top of the map there's Colcord Field No. 2, Colcord Field No. 1. Then there's one right on the border, I have to actually see where that is, EOF 15. 04:20PM
Q Hang on a second, Dr. Olsen. Let me find what you are looking at. 04:21PM
A 2.3-1.
Q And you're referring to Colcord Field No. 2 and No. 1, and what was the other?
A Right below that there is one EOF -- is that a 15 or a 16 -- 16. 04:21PM
MR. PAGE: 15.
A 15, right on the border that I'd have to check to see whether it was inside or out.
Q Why were you sampling Colcord fields outside the watershed? 04:21PM

A That was some of the first samples that we collected, and an inspection crew just going through the whole basin was -- observed litter here and -- litter application, and then it began to rain while they were out there, so they grabbed some opportunistic samples of the runoff from a land applied field if I remember the story right. 04:22PM

Q What was going on on that property; what type of facility was it?

A If I remember right, they saw actually a poultry land application, and that's why they kind of stayed around because it looked like it was going to rain, and then they collected these samples. 04:22PM

Q And did you run your PCA analysis on the edge of field samples collected from Colcord Field 1 and 2? 04:22PM

A I'd have to see if there were enough parameters that ended up to keep those in the field. I mean, they're certainly in the database, but they may have dropped out by the time that we ran through our criteria of number of parameters and so forth. So now that I think about it, actually those may have dropped out of the analysis. 04:22PM

Q Okay. In light of that, Dr. Olsen, let's go back to my question that I was trying to get an 04:23PM

answer to and, that is, with the exception of the base flow samples that you took in the three reference streams, did you do anything outside of the Illinois River watershed to validate your poultry litter chemical signature analysis? 04:23PM

A For the surface water, if we're only talking about -- are we only talking about surface water?

Q Yes, sir.

A Okay. That's what I was just trying to remember, if there was any more that were outside 04:23PM the basin. I think -- you know, I'd have to review these, but I think these were the only two that were outside the basin, so the answer would be not that I remember that we could get any more outside the basin. 04:24PM

Q Dr. Olsen, are you familiar with the stream samples that were collected immediately above and below wastewater treatment plant effluent discharges as part of what I've heard referred to as synoptic sampling? 04:24PM

A Yes.

Q Okay. Tell me what was the purpose of those paired samples.

A To determine -- in this case we only did a limited suite of parameters. So it was mostly to 04:24PM

determine loads and concentrations of phosphorus upgradient and downgradient of wastewater treatment plant.

Q And which wastewater treatment plants were being evaluated? 04:24PM

A I don't remember. I'd have to look.

Q Have you seen the data that has been generated from the analysis of those paired samples?

A Yes, I have.

Q Do you know approximately how many samples or how many sites were sampled? 04:25PM

A No. I can look it up either in the text or the maps. Do you want me to do that or you just want to go on?

Q Look it up for us, if you don't mind. When you find your source, share it with us, Dr. Olsen, so we can all follow along. Dr. Olsen, why don't we take a quick break and you can look for it on the break. I need to confer with counsel on something real quick as well. 04:25PM 04:26PM

VIDEOGRAPHER: We are now off the Record. The time is 4:27 p.m.

(Following a short recess at 4:26 p.m., proceedings continued on the Record at 4:35 p.m.)

VIDEOGRAPHER: We are back on the Record. 04:35PM

The time is 4:35 p.m.

Q Dr. Olsen, when we took a break, I think the question on the table was how many sites were there from which stream water samples were collected as part of this paired wastewater treatment plant upstream, downstream sampling? 04:35PM

A Yeah, I didn't complete that evaluation during my break. It talks about those samples on 2.33 and there is a table for subtabs 2, Table 2.8.6, but that doesn't break it down into individual wastewater samples because there were other samples collected during Phase 2. So I did find a Figure 2.8.8. It looks like it identifies the up and down samples. 04:36PM

Q Give me a moment, please. 2.8 what? 04:36PM

A 2.8-8.

Q Okay. Can you tell from looking at Figure 2.8-8 how many paired wastewater treatment plant upstream, downstream sampling sites there were?

A I think I could if I could read the writing. It's really kind of fuzzy and too small for me to see. 04:37PM

MR. PAGE: You want me to let him use my full copy here?

MR. GEORGE: Actually let me -- no. Let me 04:37PM

get to the point as quickly as I can.
Q Dr. Olsen, have you seen the data from the lab for each of these sampling locations?
A Yes, I've looked at that.
MR. GEORGE: Okay. I want to request on the Record a production of that sampling data, David. We've received, we believe, twelve of the sites' data from that analysis but not the other thirteen. 04:37PM
MR. McDANIEL: We made a Record in Darren Brown's deposition, and I followed up with Louis Bullock. 04:37PM
MR. PAGE: Did you identify the twelve sites that you do have?
MR. McDANIEL: We identified the ones we're missing. 04:37PM
MR. PAGE: Identified ones that were missing?
MR. McDANIEL: Yes, and so the Record was clear, and so that's been a little over two weeks ago and haven't gotten a response. 04:38PM
Q Dr. Olsen, what was the purpose of this synoptic sampling effort?
A Well, the purposes are outlied on the bottom of 2.33. There was many purposes, but we're just 04:38PM

been talking about the wastewater treatment plants if I understand; is that right?

Q No. Just the overall program. Just give me some summary of what the goal was, what you were trying -- why you were going about it in the way you were. 04:38PM

A There were a variety of things they were trying to accomplish in here, and we've done some extensive sampling of phosphorus all over the basin, and in looking at that, there were some long stretches of river that didn't have any phosphorus concentrations on them, so we were trying to fill that in there. Stretches that may have been impacted by groundwater, we were trying to fill some of that in. 04:38PM 04:39PM

Unfortunately we were depending on the wastewater treatment plant data generated by the actual wastewater treatment plant to evaluate loads of phosphorus. It turned out that, you know, they never did sample on the same day we sampled, so we supplemented that with some of the up and downgradient type samples, and there were a few biological type things that needed to be collected, too, fairly long reaches, groundwater impact, wastewater loads and some biological parameters that 04:39PM 04:39PM

need to be measured. So those were the overall purposes of what we call Subtask 2 of the synoptic sampling.

Q Dr. Olsen, tell me about this field lab that was set up in the Best Western in Siloam Springs as part of this synoptic sampling program. 04:40PM

A Yes.

Q Tell me about it.

A What do you want to know?

Q What was it? Describe the field lab for me. 04:40PM

A We had already done a previous field sampling using this lab. The data turned out really good, but essentially what it is, it's a way of screening the data very quickly to see if, you know, you have good distribution. It's a very good way of getting 04:40PM a widespread distribution across the basin, making assessments. In the fall of 2006 we were using it to pick sites for more intensive analysis. So I think we ended up -- targeted about 300 sites and we got like 200 field data, which we then used to 04:41PM select sampling sites for more intensive analysis but it was -- the field crew would collect the samples, and some of them had other purposes besides the -- besides the phosphorus. Like we wanted some low morning dissolved oxygen data so they got out 04:41PM

there, you know, very early. I forget. It was like 5:00 a.m. or something to try to get the low DOs. So there was some DO sampling done, but the phosphorus data is what I used most of, and that went to the lab, and it was typically analyzed the same day, you know, almost immediately. There may be some that come in late at night that they waited until the next day, and it's the standard EPA protocol that was used, the colorimetric protocol that is similar to the 4500 or the 365.2 analysis, but it's a good spectrophotometer in the field. It's a littler one that you'd have than in the laboratory, but it's a grading spectrophotometer to a high quality spectrophotometer, and essentially you add the chemical reagents and develop the color and measure the color and that converts it to a phosphate concentration. You know, we did a rigorous program. We checked standards in the field. It's also -- the chemicals are in an ampule that has a vacuum on it so you don't ever actually -- after the sample has been collected, you don't ever expose the sample to the air. So it's a very good method to get a very good sample and to get very good results very quickly. Is that enough or do you need more? The actual instrument is a

04:41PM
04:42PM
04:42PM
04:42PM

Hawk spectrophotometer; I forget the model number. It's a Hawk chemical. It's an Accu-Vac I think. I have the procedure number in there somewhere I think.

Q Let me ask this follow-up question. Who was in charge of the field lab in the synoptic sampling program? 04:43PM

A I think both the -- Dr. Chappell, Rick Chappell set that originally up, and he's done that many, many times, similar analysis in the field, and then I think he was in charge of the synoptic one, too. I think he did both programs. 04:43PM

Q Okay, and I've heard that it was physically located at the Best Western in Siloam Springs; is that right? 04:44PM

A Yes. We had an extra room that the laboratory was set up in.

Q How long was the field lab up and running in the Best Western? Let's start with in the fall of 2006. 04:44PM

A I'd have to look at the data and see the starting and the finishing date for that. It may have been two to three weeks.

Q What about in connection with the synoptic sampling program; how long would the field lab have 04:44PM

been up and running?
A There were several phases of that, and, you know, for the Subtest 2 that I was talking about, that may have been a two to three-week task, too. So I'd have to, again, check the actual analysis time of the first sample and the last sample. 04:44PM
Q Okay. You said in describing part of the objective for this field lab that it was a screening of the data to arrive at a wide distribution; do you recall saying that? What do you mean by that? 04:45PM
A We got a lot of samples across the basin. I mean, we had over -- visited 300 locations. I think we got almost 200 samples in the fall of 2006. So we were -- we were getting phosphorus, you know, in almost all the accessible areas across the basin. 04:45PM The synoptic had those specific points in mind that was outlined here that were done for phosphorus.
Q And do I understand that you would use the results of the field lab analysis to determine whether or not a particular sample would be sent for further analysis; is that right? 04:45PM
A A lot of those samples -- again, that was part of our QA/QC -- were split and sent for phosphorus analysis. In Section 3 we have a comparison of the lab data with the field data, but the fall of 2006 04:45PM

and the spring of 2007, that phosphorus P data was used to divide the whole -- the locations in the basins into quintiles. This is the ratified -- the stratified sampling I'm talking about, and then we ran and we select in those areas and the stratification was done on the field Ps. 04:46PM

Q Dr. Olsen, were there any samples that were analyzed by the field lab and as a result of the report that you got from the field lab were not subjected to further analysis? 04:46PM

A Yes.

Q Okay. Give me a sense as to how many of those.

A I don't know. I'd have to go back and look but -- 04:46PM

Q Are we talking ten or a thousand? I don't have a sense at all.

A Well, this would be percent. Again, like in 2006, fall of 2006 we ended up collecting about 200 samples if I remember right, and I'm just trying to remember how many of those actually went to a laboratory. You know, it was greater than 20 percent and probably less than 80 percent went to the lab. 04:47PM

Q That went to the laboratory? 04:47PM

A Yeah.
Q Okay. So it's possible that as many as 50 percent of the samples collected were analyzed in the field lab and as a result of those results, not further analyzed; is that right? 04:47PM
A Well, that was the way the program was set up.
Q Okay. Did you record the measurements or values or the results of the analysis in the field lab?
A Yes. 04:47PM
Q Where is that recorded?
A Those are in spreadsheets I have. I think the fall of 2006 is actually in the database. My Section 3 has comparison of all the ones that went to the laboratory and ones that didn't and, again, 04:48PM those are all in spreadsheets that would have been in my considered material. It's all there, even the ones you were requesting. I know it's in there because I've seen it in my produced materials.
Q How would I find -- because your considered 04:48PM materials are voluminous; you agree?
A Yeah.
Q You produced a lot of material?
A Yeah.
Q How would I find the results from the field 04:48PM

lab of the samples that you did not send on for further analysis?

A They're on the same spreadsheet of the ones we sent in and that same spreadsheet has the lab value that we got back in the -- from the field, and the ones that don't have those two values, you know, weren't sent in for laboratory analysis. So to answer your question, where can I find it, I'd have to look for that and tell you where it is in my electronic files. 04:48PM 04:49PM

Q Would you do that?

A Yeah. It would be pretty easy for me to do.

Q Okay. Dr. Olsen, you said some of the field data from the field lab in 2006 was in the database?

A I think they got the 2006 in the database, but for some reason the 2007 did not get in there. I'd have to confirm that, though. 04:49PM

Q Did you use any of that field data in any of your analysis, including the PCA analysis?

A Well, again, I couldn't use it in the PCA and we never submitted those samples or a complete suite, so it wouldn't have ended up in the PCA but -- 04:49PM

Q Let me stop you there. You did you not use the field data for samples that were not further 04:49PM

processed by the lab in your PCA analysis; correct?
A That's right, but I depended on it to select the sites that I did do the full sampling at.
Q I understand that. Did you use the field data in any other analysis in this case? 04:50PM
A Again, it's presented on some of my figures, particular one figure showing the -- because it's a good representative of the extent of contamination throughout the basin because it was -- you know, it was the largest really sampling that we did in a 04:50PM short period. So I actually present that data on one of my figures showing that, you know, the overall extent of contamination using that field data.
Q Which figure are you referring to? 04:50PM
A If I have a list of tables, I could probably find it quicker. Data -- that's it. Average synoptic P. It's Figure 6.6-4A.
Q Hang on a second and let me get there, Dr. Olsen. 6.6 what? 04:51PM
A 6.6-4A.
Q Tell me what this is.
A Average -- the figure is labeled average synoptic P, and that 492 is the instrument method number that we used in the field, so that's all that 04:52PM

refers to. They put that there to distinguish it from laboratory data. The other one has like 4500 and stuff like that, so this is the field data. This is the fall 2006 data.

Q Dr. Olsen, does this show the reported values for phosphorus in the samples that were not sent to the lab for further analysis? 04:52PM

A Yes. This should be everything.

Q Okay, and now I'm unclear. Is this the fall of 2006 data or the synoptic data that was collected in 2007? 04:53PM

A This is the fall of 2006.

Q What about the synoptic sampling that was conducted; can you point me to anything in your report that would show me the results of the field analysis of those samples? 04:53PM

A I did not to my knowledge use any of that data in my report. It's in my considered material and I did not put anything about those results or evaluations of those results in my report that I remember. 04:53PM

Q Figure 6.6-4A shows phosphorus concentrations. Did you collect other data associated with those sampling points and have it analyzed in the field lab? 04:54PM

A All those samples had some field parameters, if I remember right, including dissolved oxygen, temperature.

Q Where would I find the rest of the data on those parameters from the field samples analyzed in the field lab but not sent for further analysis? 04:54PM

A They definitely would be in the field notebooks. I think that data got put on the spreadsheet, too. I'll have to look when I find that. 04:54PM

Q Help me understand, Dr. Olsen, and let's use phosphorus as an example for a parameter. What you would look for in the results at the field lab to determine whether or not a particular sample warrants further analysis or not? Do you understand the question? 04:54PM

MR. PAGE: I'll object to the form.

A There really wasn't -- that particular sample, if I remember right there, there really wasn't any criteria which ones went to the lab. It was just a validation that we wanted to do a pretty high percent of them to validate the lab, the lab analysis of phosphorus, and then those samples were subjected to further analysis of some of the nutrients. So I'd have to recheck for sure, but 04:55PM

that's the way I remember it. It was just like every -- if it was 20 percent we were shooting with, it was, you know, every five samples went to the laboratory for further analysis.

Q Was it truly random in terms of what samples got screened out and which ones were sent for further analysis? 04:55PM

A I don't know. I'd have to check and look at the actual ones that went.

Q Well, was there an SOP that governed this field lab operation? 04:55PM

A I'd have to check on that. There was a description of the analysis in the SOP and how that was conducted. I don't know if there was a description of selecting further samples for the analysis. I knew there was in the work plan of what the goal was, of what the percentage goal was. I think we way exceeded that. In fact, I know we exceeded the percentage goal that we wanted, and I don't remember the exact reasons for that. 04:56PM

Q But you can't recall the criteria as we sit here today for determining which sample got further analyzed and which ones did not; is that right?

A Well, to the best of my recollection, you know, we were shooting for like 20 percent, which 04:56PM

would mean one in every five. We, of course, want high concentrations and low concentrations so we kind of looked at that to make sure that the lab data we got back, as far as the phosphorus, represented the range of concentrations we want so that we could validate the total range. Whether they just ended up doing one in every five -- I know they did more than that, so they may have started sending more in because maybe the biologist wanted, you know, more nutrient data or whatever. I can't remember exactly, you know. Then maybe they selected every other sample or something like that. I'd have to go back and look at the spreadsheets and confirm, you know, exactly how that was done. 04:57PM 04:57PM

Q Dr. Olsen, you would agree with me, I assume, that it would be scientifically dishonest to screen the data in such a way as to send only those samples that had higher phosphorus concentrations in for further analysis? 04:57PM

A Well, it would be depending on what the goal of the analysis was. In my particular case I wanted complete concentrations ranges, so I wanted low and high and -- 04:57PM

Q If your goal -- I'm sorry.

A -- as I understand, that's what the biologists 04:58PM

needed, too. They wanted -- they wanted -- to do their analysis, they need high, medium, low-type samples, and that's why we did -- ultimately when we collected the samples for a full suite of analysis for me for my PCA and for the biologists for their ultimate analysis, they used the whole dataset and stratified it by concentrations, and then they randomly picked in each of the strata to get a representative sample. 04:58PM

Q But you're not sure whether that same criteria was applied to the field lab; is that right? 04:58PM

A Well, the dataset, the phosphorus dataset, the overall purpose was to come up with a stratified random design that we could collect samples that would have the total range of concentrations because we needed that analysis to do that. So what data that was collected for me, it created a good map of the distribution of phosphorus across the basin. I don't know what the biologists used that few extra data for. You'd have to ask Jan Stevenson. I know there were -- some of those samples were sent in for nitrogen species. I know he was doing some comparison of nitrogen to phosphorus but, you know, as far as I know, anyway from my analysis, none of that ended up in my ultimate use for my own opinion. 04:59PM 04:59PM

It did dictate where I collected samples, though, which is very important.

Q Okay. Dr. Olsen, assume with me that the goal of the investigation in this case was to develop a dataset that was representative of the environmental conditions of the watershed; can you agree to that assumption? 04:59PM

A Okay.

Q If that's the goal, do you agree that it would be scientifically dishonest to screen the data through the field lab in such a way as to send in for further analysis only those samples that would report high concentrations of constituents of concern? 05:00PM

A If you wanted a representative to represent the population density out there and the range of populations, that would not be the way to do it. 05:00PM

Q Okay. Let's segue to principal component analysis, Dr. Olsen. Dr. Olsen, before we get into the weeds of a difficult subject, I want to confirm my general understanding of how you've conducted your PCA analysis and how you interpret the results. Okay? It's my understanding that you believe the results of your principal component analysis show two primary principal components; is that correct? 05:01PM

A The surface water ones, yes.
Q Okay, and those two primary principal components are referred to as Principal Component 1 and Principal Component 2; is that correct?
A For surface water, yes, that's correct. 05:01PM
Q Now, Dr. Olsen, when you run your principal component analysis software, which, by the way, is Sysstat; correct?
A That's what that part does, the PCA, that's right. 05:02PM
Q Okay. So when you run that particular program -- it's a computer program; correct?
A Yes.
Q We'll get to my question in a minute. When you run that computer program, Sysstat, you get a 05:02PM Principal Component 1 and a Principal Component 2 score for every sample; is that right?
A Those scores are actually done outside Sysstat.
Q Okay. Let me broaden my question now. When 05:02PM you complete your principal component analysis, using whatever programs you use, okay, you get a Principal Component 1 and a Principal Component 2 score for every sample; is that correct?
A We actually created scores for the first five 05:02PM

principal components under six different rotations, so we have actually have -- for every run I did, there should be 25 to 30 lists of scores for every sample.

Q Okay, but just as a function of the way the software works, you're always going to get a Principal Component 1 score and a Principal Component 2 score; you may get other scores as well; right? 05:03PM

A The total software, that's what we're generating, a Principal Component 1 score and a Principal Component 2 score for individual samples.

Q So there's nothing magical about the fact that when you feed data into the software program, you get a score that's called Principal Component Score 1 and Principal Component Score 2? 05:03PM

A That's correct.

Q Dr. Olsen, if I understand correctly, you believe that the results of your principal component analysis on water samples has identified two primary principal components as explaining the variations that you see in the chemical compositions of the water samples; correct? 05:03PM

A The majority of the variations.

Q Okay. For purposes of your principal 05:04PM

component analysis work in this case and your opinions about the source of contamination in particular samples, do I understand correctly that you've concluded that all samples with a Principal Component 1 score of greater than 1.3 are in your opinion impacted predominantly by poultry litter?

A There may be a few minor exceptions in there. I'd have to go review it. There's some question about the CP samples that we collected this morning, so, you know, that needs further analysis. So there's -- and a few samples I couldn't verify locations of so I kind of excluded them, so there's a very, very few, but generally that statement is true. 05:04PM

Q Well, Dr. Olsen, in your report you said that a Principal Component 1 score of 1.3 or greater is consistent with and supports your opinion that that sample reflects contamination from poultry litter; is that right? 05:05PM

A Yeah, and I need to clarify that a little bit more. There were some -- in that particular count, I included inadvertently some of the wastewater treatment plant discharges, so I need to take that out of those percentages and analysis. 05:05PM

Q I didn't really ask about percentages so I'm 05:05PM

confused as to exactly what you are talking about. What are you talking about?

A There were three wastewater treatment samples that were scored and typically those had a principal component score of above 1.3, and I would say that those probably weren't contaminated by poultry. 05:05PM

Q Which three wastewater treatment plant facilities are you referring to or samples?

A There was one from Siloam Springs, I think from Rogers -- you want me to look that up for sure? 05:06PM

Q Sure.

A Siloam Springs.

Q What are you referring to, Dr. Olsen?

A Oh. Table 6.11-11.

Q 6.11-11? 05:07PM

A Yes.

Q Okay. Now, I don't have a Table 6-11.

A 6.11-11?

Q I don't have that.

A Largest PC2 scores and locations. 05:07PM

Q I missed a copy in my set. Can I look off of yours?

A Sure.

Q All right. Which wastewater treatment plant samples are you referring to? 05:07PM

A There's a Siloam Springs wastewater treatment plant discharge.
Q On March 31st of 2008?
A Yes.
Q Okay. 05:08PM
A You need to see that, too, David?
MR. PAGE: I'm just going to look over your shoulder. Thank you.
A There's one.
Q Could you put a star by the one you are identifying? 05:08PM
A This is an exhibit, isn't it?
Q It is, yes, sir.
A Okay. Springdale is the next one.
Q And for the Record, that's Springdale wastewater treatment plant, also collected on March 31st of 2008; is that right? 05:08PM
A Yes.
Q Okay. Now, are those the only two?
A No. There's three. Rogers wastewater treatment plant. 05:08PM
Q Okay, and for the Record, you've identified the sample collected from Rogers on April 1st of 2008; correct?
A Yes. 05:08PM

Q Okay. Those are the only three you are referring to?
A Yeah. We collected a Lincoln sample but it was not a discharge sample. It was actually in the stream downgradient. Even though it's identified as a wastewater treatment plant, it was actually in a stream downgradient, so it's actually a stream sample. 05:09PM
Q Okay, and, Dr. Olsen, if I understand your earlier comments, the three samples that you've just identified, which are effluent from wastewater treatment plants, had PC1 scores in your analysis above 1.3; is that right? 05:09PM
A Yes, PC1 scores, yes.
Q All right, and 1.3 has a score for PC1 is the value you are using to identify a surface water sample as predominantly contaminated by poultry waste; correct? 05:09PM
A No. That's the difference, and that's what I need a little bit of clarity in my text. These are not -- even though they have a score above 1.3, they are not in the circle that's dominated by poultry waste because they have a higher -- see, they have these high, very high PC2 scores, so it puts them out of that dominant field. 05:09PM 05:10PM

Q Okay. I'm sorry. Go ahead.
A So there's -- what I'm just trying to do is clarify the text there when I said that anything above 1.3 had poultry contamination of the PC score. As you see, that's probably not true, and so I'm just trying to clear that up, and these are three examples, but the ones that are dominated are definitely identified. 05:10PM
Q Well, what is the criteria as clear as you can state it as of today in terms of PC1 and PC2 scores for you to offer an opinion that a particular sample is predominantly impacted by poultry waste? 05:10PM
A To make that contrast, I need to determine a range of both PC1 and PC2, and those are on my circles of my photograph, and I can tell you that by looking at it. 05:11PM
Q Let's do it because I want to get the criterion standards down before we get too far into this. It's figure 6.11-18C I think is what you are referring to, Dr. Olsen. 05:11PM
A Yeah, it's 6.11-18C.
Q Let me get there. Okay. Dr. Olsen, tell us what are the range of PC1 and PC2 scores that you need to see in your principal component analysis to identify a particular sample as being predominantly 05:12PM

impacted by poultry waste.
A First of all, look at PC1. It's on the bottom horizontal axis. So you can see I've drawn a red line there, and if you take that down, it's approximately at 1.3, so PC1 above 1.3, and then you can see up to approximately PC5 on PC2 that that would be the criteria there. You see there's some overlap between wastewater treatment dominant and poultry waste dominant. That would be in the area that, you know, it's about 50-50, so I still drew a little overlap there because based on my spatial analysis, you know, those are still impacted by poultry and impacted by wastewater treatment, too. 05:12PM 05:13PM
Q Okay. Let's get the Record clear here, if we can Dr. Olsen. If I understood your response, if your PCA on surface water shows a PC1 score of above 1.3 and a PC2 score of below 5, you're prepared to offer an opinion that that sample and all samples within that range are predominantly impacted by poultry waste; is that correct? 05:13PM 05:14PM
A Yes, but as we already discussed this morning, there's a couple cow samples that fall within this range that we -- that because they fall in there, there's in my opinion some poultry contamination in them, but that has to be investigated further, but 05:14PM

that's really the only two exceptions that I know about.

Q So, Dr. Olsen, there are some instances in which a sample will meet your criteria, as we've just established it for Principal Component 1 and Principal Component 2 scores, that would qualify as possessing the chemical signature for poultry waste that you are trying to exclude; is that right? 05:14PM

A What was that again?

MR. GEORGE: Could you read it back, Lisa?

(Whereupon, the court reporter read back the previous question.)

A Those are the only two samples I know about.

Q And, Dr. Olsen, how or what criteria can we apply to pick and choose between the dots that are inside of the oval that you have identified as poultry waste dominant impact to determine those that are impacted and those that are not? 05:15PM

A Well, the conclusion is that they would be all impacted. I just know that those two samples were collected from a cattle pasture, so I'm questioning that and say, you know, need to look at further why they plot there. It certainly looked like poultry contamination are in those samples and from this I would conclude there are, but based on what we know, 05:15PM 05:16PM

we should, you know, look at that further.
Q So that's an instance, Dr. Olsen, in which your understanding of the real-world conditions is not lining up with how you are interpreting your principal component analysis; is that fair? 05:16PM
A That's the only exceptions. You know, I tried to check -- that's part of the temporal and spatial evaluation you do. You try to check all of these to make sure they line up with what you know about the sample, too. 05:16PM
Q How did you not catch those cow pasture samples plotting in the range that you have defined as the chemical signature for poultry litter?
A I did, and I was very straightforward about it. I actually put a separate whole figure with 05:16PM those samples in it and said they don't look like they're representative of cow.
Q On Figure 6.11-18C, are the cow pasture samples that we're referring to within the circle of poultry waste dominant impact? 05:17PM
A Yes, those two samples are.
Q Why didn't you call them out here?
A I did in another figure. Do you want to know that figure?
Q Sure. Tell me the figure you are talking 05:17PM

about.
A It's the last figure in the report, 6.11-25.
Q 6.11-25, tell me what this is.
A There's the four dots for the samples we identified this morning and read into the text. The two that plot very different out of the poultry dominated field and what you would expect from what I know about cattle waste are the two spring samples that are -- the one is very, very high. That's the one we knew for sure had cattle right in it, and so to me, that more represents what a PC score should look like based on the composition and everything, and then there's that other spring plot right around a score of PC1 of about 1.5 and PC score of 6.2, so it's still not in the cattle -- in the poultry field. So it's these two samples that are reflected on the --
Q Mr. Fite's property?
A Mr. Fife's (sic) property that we discussed this morning. The plot was in the poultry range, and that's why -- one of the reasons why, you know, I expect there was in my opinion, you know, some type of other contamination in that, including poultry.
Q Okay. Can you circle -- you've got a green

05:18PM
05:18PM
05:18PM
05:19PM
05:19PM

pen in your hand, Dr. Olsen. On Figure 6.11-25, can you circle each of the cow pasture edge of field samples that plot within the range you've defined as the chemical signature for poultry litter?

A I'd have to check for sure which of those two are and transform them to that other one. 05:19PM

Q Well, you know it's these two, correct, or do you not?

A Yes, it's those two, but I don't know exactly which of those dots are -- 05:19PM

Q No, no. I want you to circle it on here.

A Oh, I thought you said circle them on there. I'm sorry.

Q No. Circle it on Figure 6.11-25.

A Okay. 05:20PM

Q And you've circled them in green; correct?

A Yes.

Q Now, within those circles that you have drawn, there are some other samples that plot; correct?

A Yes. 05:20PM

Q They're in close proximity to the cattle, cow pasture samples that you have questions about?

A Yes.

Q Okay. Are those samples predominantly impacted by poultry waste? 05:20PM

A Yes. All the other samples within the circle are predominantly in my opinion --
Q How do you know that?
A -- dominated by poultry waste impact. Because I've done an analysis of where they are in the basin and, again, this is a very definitive analysis of poultry waste impact in my opinion. Two samples that were potentially not representative from a cow pasture that may be impacted by, you know, groundwater or springs and other things that have poultry do not make me change any opinion about that's the dominant field for poultry. 05:20PM 05:20PM
Q Dr. Olsen, you said you're confident that those other samples are impacted by poultry waste, the other samples in close proximity to the cow pasture? 05:21PM
A Yeah, several of them all within the circle.
Q Okay, and you said that you have confidence in that because you've done spatial analysis; is that right? 05:21PM
A Spatial analysis of where they were sampled and how they were sampled, yes.
Q Well, tell me about that spatial analysis. What did you do for each one of the data points that you have plotted in the area that you define as 05:21PM

poultry waste dominated or the chemical signature for poultry; what did you do to confirm through your spatial analysis that you have correctly identified those as contaminated by poultry waste?

A It's all described in my report but essentially I looked at the locations of those and what type of samples they were. 05:21PM

Q How does that --

A Whether they were edge of field or not and, you know, whether they were surface water, whether they were high flow stations, whether they were base flow, whether they were high flow, and they were, you know, downgradient of poultry waste application and would be impacted by poultry waste application potentially. 05:22PM

Q Dr. Olsen, explain to the court how that analysis that you've just described allows you to identify to a reasonable degree of scientific certainty that the chemical composition in those samples is the product of poultry waste contamination. 05:22PM

A That was not the only thing I did. Again, everything is explained in the steps that I went through on how I identified that. The other one was comparing it to chemical compositions of the actual 05:22PM

waste, comparing it to the runoff. That was all part of the comparative analysis, that I knew that that is the field where poultry waste is dominant.

Q Dr. Olsen, you'll agree with me that your spatial analysis in and of itself does not give you the ability to offer a chemical signature opinion in this case? 05:22PM

A It's part of the analysis to verify that those are dominated. I mean, that's what made me question the poultry -- the cattle waste, the Fife (sic) properties because how they were collected and where they were collected. 05:23PM

Q Let's get back to where we kind of got off on this tangent. What is your criteria today in terms of Principal Component 1 and Principal Component 2 scores for identifying a sample as being related to contamination from a wastewater treatment plant? 05:23PM

A Again, Figure 6.11-18C, everything above a PC2 score, I think it's 4.7 -- I should check the text on that. It's either 4.7 or 4.8, and in this case it's anything greater than about, you know, 1.3 on PC1 and less than about PC1 score 2. 05:24PM

Q So, Dr. Olsen, any sample that falls in that range of Principal Component 1 and Principal Component 2 scores, you are prepared to offer an 05:24PM

opinion is predominantly impacted by wastewater treatment plants; is that correct?

A Or similar constituents to wastewater treatment plant.

Q Well, that doesn't help me. What do you mean by that? 05:24PM

A Well, there's a couple of residential wells that fall in that group that potentially could be contaminated by wastewater treatment or human-type waste. 05:24PM

Q So, Dr. Olsen, there are some residential wells samples that plot out in this range that you've just described as the wastewater treatment plant impacted samples; is that right?

A Yes, that's right, and I did identify those in the text. 05:25PM

Q Help me find those, please.

A 6.61, the paragraph before the evaluation of potential impact of cattle manure.

Q What page at the bottom? 05:25PM

A Page 6.61.

Q Is there a page number in the right-hand column?

A 6.61.

Q Oh, 6-61.

A I'm sorry, I kept saying point.
Q That's okay. 6-61. Point me to the residential wells that fall on your plots into an area that you've defined as wastewater treatment plant dominated. 05:26PM
A Yes. The last paragraph before the evaluation of potential impact of cattle manure, it says in addition to the samples showing poultry waste impact, some groundwater samples have higher PC2 scores that -- than the typical samples identified 05:26PM as being impacted with poultry waste contamination, which had relatively lower PC2 scores. These groundwater samples potentially show human impact. Overall about 20 wells may show potential human impact. 05:26PM
Q So, Dr. Olsen, what sample station identifiers are associated with those 20 wells?
A We'd to check an appendix and mark those off. The scores are in the -- I forgot what appendix. So we would go to those residential samples and pick 05:27PM those off with a higher PC2 score.
Q Dr. Olsen, what's the source of contamination with human waste of those residential wells in your opinion?
A You know, these are residential wells. It may 05:27PM

be a septic tank or something similar to human waste.

Q So you found 20 groundwater wells that you believed may be contaminated from septic tanks; is that right? 05:27PM

A Potentially human impact, whether, you know, someone -- the casing wasn't right, something. It could be something besides septic tanks, but in my opinion there's contamination there that looks like human waste. 05:27PM

Q And on what basis did you determine that those wells were contaminated by something other than wastewater treatment plants even though they met your criteria?

A Well, they're in the wastewater treatment plants, but again that's the spatial analysis. You don't potentially have a wastewater treatment discharge going into the well. 05:28PM

Q Okay. Let me try to summarize what I've heard, Dr. Olsen, and see if you agree with me because I'm not sure I'm following you completely. If I've heard you correctly, sometimes a Principal Component 1 score of above 1.3 but below a principal component score of 5 equals the chemical signature for poultry waste, but sometimes a Principal 05:28PM

Component 1 score of above 1.3 and a Principal Component 2 score of below 5 does not equal the chemical signature for poultry waste; is that right?

A No. I said that there are two examples out of hundreds of examples that, with my analysis, we need to examine further. They may be impacted by poultry waste. So I just was pointing out those two as being from my analysis, they look like they're impacted by poultry waste. I don't think that affects any of my other analysis because those are the only two that had an odd spatial representation, and so I haven't said sometimes that, sometimes the other. It's exactly what I said. All those samples are impacted, and these two need to be explained further why they look like they're impacted, too. They may be. 05:29PM 05:29PM 05:29PM

Q Dr. Olsen, given your examples and your hesitation or concerns over those samples, you're not prepared, are you, sir, today to offer a bright line opinion that any surface water sample that scores out on Principal Component 1 above 1.3 and scores out on Principal Component 2 of below 5 possesses the chemical signature for poultry litter? 05:30PM

A Yes, I am.

Q You're prepared to offer that opinion today? 05:30PM

A Yes.
Q And that would include the cattle edge of field samples?
A As I said, we need to do that with caution, but everything else in my opinion is impacted, so it looks like those are impacted, too. 05:30PM
Q Okay. Dr. Olsen, I need to know once and for all as we sit here today, are you offering the opinion that the cattle edge of field samples possess the chemical signature for poultry waste? 05:30PM
A Yes, they do.
Q Okay. Now, let's go to the wastewater treatment plant signature. If I understood your testimony correctly, Dr. Olsen, sometimes a Principal Component 2 score of above 4.7 equals the chemical signature for impacts from wastewater treatment plants, but sometimes a Principal Component 2 score of above 4.7 does not equal the chemical signature for wastewater treatment plants; is that correct? 05:31PM
A No, not at all.
Q Explain to me how what I said is wrong.
A This Figure 6.11.18C, those in that circle are all impacted by wastewater treatment plants. I've verified all of those inside that circle. 05:31PM

Q Well, Dr. Olsen, are your residential wells on Figure 6.11-18C?
A No.
Q Okay. If you plotted the PC1 versus PC2 scores for your residential wells on this chart, where would they fall? 05:32PM
A Some of them would fall -- I said that definitely. Some of them would fall -- I'd have to plot them for sure, but some of them would fall within that range as I said here. Those in my opinion have characteristics and contamination similar to human waste. 05:32PM
Q Well, is your signature with respect to wastewater treatment plants a signature for the discharge of treated sewage from those facilities or is it just a generic human waste signature? 05:32PM
A Specifically on this figure where I've identified the dominant samples, it's a signature for wastewater treatment plants. I have not done that circle around the geoprobes. I'm saying -- excuse me. Around the -- 05:32PM
Q Residential wells?
A Around the residential wells. I have noticed, though, that those would plot within the circle if we're on this figure. They aren't on this figure, 05:33PM

so I'm being up front in saying those are contaminated, and they look like human waste would be my explanation because they look like wastewater, which is, you know, human waste.

Q Dr. Olsen, the assumption there is that there is a source of human waste in the environment that would have a similar chemical composition to the treated discharge of a wastewater treatment plant? 05:33PM

A You could have some of the major characteristics, and that's why they plot within that circle, that's right. 05:33PM

Q What have you done to test that assumption?

A That's what I just told you. You know, it could be a variety of things, including septic tanks or -- 05:33PM

Q No. Dr. Olsen, what have you done to test that assumption?

A I have not done the complete analysis of where these 20 wells were. I've not completed that analysis. 05:34PM

Q I think we're at the end of a tape, Dr. Olsen. Let's stop for the day.

VIDEOGRAPHER: This concludes Volume I of the deposition of Dr. Olsen. We're now off the Record. The time is 5:34 p.m. 05:34PM

(Whereupon, the deposition was recessed at 5:34 p.m.)

SIGNATURE PAGE

I, Roger Olsen, PhD, do hereby certify that the foregoing deposition was presented to me by Lisa A. Steinmeyer as a true and correct transcript of the proceedings in the above styled and numbered cause, and I now sign the same as true and correct.

WITNESS my hand this _____ day of _____, 2008.

_____

ROGER OLSEN, PhD

SUBSCRIBED AND SWORN TO before me this _____ day of _____, 2008.

_____

Notary Public

My Commission Expires:

_____

C E R T I F I C A T E

STATE OF OKLAHOMA)
) ss.
COUNTY OF TULSA)

I, Lisa A. Steinmeyer, Certified Shorthand Reporter within and for Tulsa County, State of Oklahoma, do hereby certify that the above named witness was by me first duly sworn to testify the truth, the whole truth and nothing but the truth in the case aforesaid, and that I reported in stenograph his deposition; that my stenograph notes were thereafter transcribed and reduced to typewritten form under my supervision, as the same appears herein.

I further certify that the foregoing 294 pages contain a full, true and correct transcript of the deposition taken at such time and place.

I further certify that I am not attorney for or relative to either of said parties, or otherwise interested in the event of said action.

WITNESS MY HAND AND SEAL this 18th day of September, 2008.

_____

LISA A. STEINMEYER, CRR
CSR No. 386

CORRECTIONS TO THE DEPOSITION OF

ROGER OLSEN, PhD Volume I

PAGE AND LINE NUMBER	CORRECTION